PES Environmental, Inc.
Engineering & Environmental Services

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A Report Prepared for:

Univar USA Inc.
3950 NW Yeon Avenue
Portland, Oregon

DRAFT STORMWATER PATHWAY INVESTIGATION WORK PLAN

UNIVAR USA INC. PORTLAND, OREGON

JUNE 25, 2008

By:

Matthew V. Dahl

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DRAFT 7-17-08

Mr. Howard Orlean
U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue, AWT-121
Seattle, WA 98101

Subject: *Draft Stormwater Pathway Investigation Work Plan* for the Univar USA Inc. Facility dated June 25, 2008

Dear Mr. Orlean:

The Oregon Department of Environmental Quality (DEQ) appreciates the opportunity to provide comments on Univar's Stormwater Pathway Investigation workplan, dated June 25, 2008. Univar's facility discharges into the City of Portland's (COP) Outfall 18 stormwater conveyance system and this stormwater evaluation is a crucial piece of the overall evaluation of stormwater source control needs within that outfall basin.

DEQ also appreciates the thoroughness of Univar's workplan and Univar's willingness to align it with DEQ's Guidance for Evaluating the Stormwater Pathway at Cleanup Sites (5/08 Draft). This will help ensure that the investigation will produce the information DEQ needs to assess source control needs for both the site and the basin as a whole.

DEQ's comments include requests for the opportunity to review and comment on certain decisions/workplans that will arise as the evaluation unfolds. These requests are aimed at ensuring that the data produced through this investigation will continue to meet DEQ's needs and to minimize the likelihood that additional work or rework will be needed. If EPA supports these requests, DEQ will make it a priority to expedite its reviews to minimize any impacts to Univar's proposed schedule. DEQ is also willing to meet with Univar and/or EPA at the site to work through any of these questions/issues if either party would find that to be helpful for reaching agreement on workplan specifics.

<u>Comments</u>
1. DEQ requests that Univar provide the following information to assist DEQ with both its evaluation of proposed sampling locations and its interpretation of sampling data.

- When were catch basins on the site last cleaned out? What is the anticipated schedule for cleaning them out in the upcoming year? Will this occur before, during or after the sampling events, assuming sampling occurs on the proposed schedule?

- Please provide the complete data set of historical NPDES stormwater sampling data, indicating sampling locations and dates.

- Please provide additional information on the east drive re-paving project. What is the overall objective of this project and its schedule for completion? Describe that soil sampling that took place or is planned to be undertaken in conjunction with the project and provide maps showing sampling locations and laboratory data reports from previous sampling efforts. Describe the excavation activities, including the timeframe of soil disturbance, and the procedures and findings for soil characterization and disposal.

- What does Univar believe to be the source of the pesticides detected in soil samples from the east drive re-paving project? Is there reason to believe these chemicals may also be present at elevated concentrations elsewhere on the site? Is Univar planning any additional soil sampling efforts to characterize the nature and extent of pesticide contamination on the site?

2. Section 5.1 indicates that the list of COIs will be restricted to those chemicals that are associated with Univar's operations and cleanup activities and are listed in the draft DEQ guidance. However, Section 5.5 of the DEQ guidance clearly states that some sites may have additional site-specific COIs which potentially include chemicals that are not included in the list of chemicals in Appendix D of the guidance. Given this, Univar should not use the list of chemicals in the DEQ guidance as a "filter" for its list of site COIs.

expand

3. Section 5.2 indicates Univar's intent to provide an updated stormwater drainage map after completing a more thorough of the stormwater system. The updated map should more accurately depict the boundary of the areas that drain to each discharge point into the stormwater collector along the eastern border of the site and the direction of overland flow toward each inlet/catch basin within each drainage area.

4. In Section 5.3, the second paragraph states that Univar will eliminate potential COIs from the SPI evaluation if they are below laboratory MRLs and/or detected below SLVs in catch basin sediment and stormwater samples, not handled in bulk at the property, not handled outside of the warehouse at the property, and not sampled for under the current groundwater and stormwater monitoring programs. DEQ does not support this approach. The inherent variability of catch basin sediment samples and stormwater samples and the limited number of samples being proposed under this approach warrant a conservative approach to data interpretation. Other lines of evidence should be considered before dropping any chemicals from the analyte list, such as the pesticide detections in soil sampling data from the eastern drive and the elevated PCB concentrations found in stormwater, suspended sediment and inline sediment samples collected by the City of Portland and the Lower Willamette Group in Outfall Basin 18. DEQ requests the opportunity to review and comment on any proposed changes to the analyte list to ensure the sampling efforts will result in sufficient data to support any decisions regarding stormwater source control at the site.

I don't think any should be dropped - they are only doing 2 samples & should do full suite in both

5. Section 6.1 lays out the rational for selecting chemicals to be included as site COIs. In accordance with comment #2 above, DEQ recommends that all COIs associated with

historical spill and releases (Section 6.1.1) be retained. However, DEQ supports Univar's contention in Sections 6.1.5 and 6.1.7 to drop a few chemicals from the list as DEQ does not view these chemicals as site COIs.

6. In Section 7.2, the second bullet indicates that Univar may undertake cleaning and flushing of the stormwater lines if necessary to complete its groundwater infiltration evaluation. If Univar finds it necessary to conduct line cleaning/flushing, DEQ requests that they follow the procedures and notification requirements described in the fact sheet found at http://www.deq.state.or.us/lq/cu/nwr/PortlandHarbor/docs/CatchBasinInlineSediements.pdf This would include obtaining prior approval for the waste characterization and disposal workplan to ensure that the analytical suite is adequate to support the source control evaluation.

7. In Section 7.2, the last paragraph indicates that Univar will produce a revised stormwater drainage basin map upon completing the drainage system evaluation, and will use this information to select representative locations for catch basin sediment sampling. See comment #3 above regarding refinements to the map. In addition, DEQ requests the opportunity to review and comment on the proposed catch basin sampling locations before Univar commences with sampling to ensure the selected locations will provide the most useful information for the stormwater source control evaluation.

8. With regards to Section 7.3, if the video inspections indicate groundwater infiltration is occurring and therefore further evaluation is needed, DEQ requests the opportunity to review and comment on the proposed catch basin sampling workplan prior to the commencement of sampling to ensure the workplan will produce information DEQ needs to support its assessment of source control needs at the site.

9. Section 8.4 describes the proposed stormwater sampling locations. DEQ has several questions or concerns about the proposed locations for stormwater sampling. For example, DEQ would prefer to see catch basin sediment data from Drainage Areas #5 and #6 before determining whether stormwater sampling is warranted in these areas. In addition, DEQ would prefer to evaluate the catch basin sediment data and possibly historical NPDES data to assess whether the proposed locations are best suited to the objectives of this investigation, and to better understand the nature and schedule of the repaving work on the eastern driveway, before the stormwater sampling locations are finalized. Accordingly, DEQ requests the opportunity to provide comments on the proposed stormwater sampling locations after obtaining and reviewing said information.

10. Section 10.0 describes Univar's proposed reporting schedule. DEQ recommends that Univar augment its reporting schedule by providing a number of interim reports for agency review to ensure the investigation is proceeding in a manner that will produce the information necessary for accomplishing the objectives of this evaluation. Specifically, DEQ recommends that Univar submit the results of the catch basin sampling events prior to initiation of stormwater sampling so that the agencies can provide input on stormwater sampling locations based upon those findings. DEQ also recommends that Univar submit interim data reports from each stormwater sampling event to ensure data quality

objectives are being met and to help identify any source control concerns or questions earlier rather than later in the process so the approach can be modified or other actions be undertaken as appropriate.

11. Note that the screening tables in Appendix D of DEQ's draft guidance document contain two worksheets with stormwater SLVs. One table is for Portland Harbor sites and the other is for non-Portland Harbor sites. Most SLVs are the same but there are a few differences. It appears that you referenced the non-Portland Harbor worksheet in Table 7, and possibly other tables as well.

Sincerely,

Karen Tarnow, Portland Harbor Stormwater Coordinator
Environmental Cleanup Section

cc: Linda Scheffler, City of Portland
Kristine Koch, EPA
George Sylvester, Univar
Matthew Dahl, PES Environmental, Inc.
ECSI File #330

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

21 July 2008

MEMORANDUM

TO: Howard Orlean, Project Manager

FROM: René Fuentes, Hydrogeologist
Office of Environmental Assessment

SUBJECT: Review of Univar Draft Stormwater Pathway Investigation Work Plan, Portland Oregon site, dated June 25, 2008

GENERAL COMMENTS

The plan is overall well written, but appears to have some statements and information that do not seem logical from the perspective of someone who does not normally review Stormwater sampling plans. I am including those items which do not seem understandable to me realizing that there may be very good reasons for their being used if I was more familiar with this program, however, since they do not make complete sense from my perspective it may be good for others to have those issues explained in the document.

It is also my understanding that this plan is being done to determine the potential for the contaminants to reach the Portland Harbor Superfund site, and therefore I would expect that sites subject to these requirements would use the same methods developed by the EPA, ODEQ and City of Portland to sample the stormwater discharges as part of the Harbor Superfund RI/FS sampling plan. This draft plan seems to be consistent with other City requirements, which are discrete samples rather than the more comprehensive composite samples used for Portland Harbor. It seems that this sampling plan, and those for facilities with similar requirements and in the Portland Harbor basin, should be based on the LWG Portland Harbor RI/FS Round 3A Field Sampling Plan Stormwater Sampling, dated March 1, 2007 or later modifications.

SPECIFIC COMMENTS

1. Section 3.3.1. Historical Sampling Results. The values and logic on Tables 6 & 7, related to this section do not seem to make much sense as presented. It is unclear why the screening level values from the Joint Source Control Strategy (JSCS) and the permit numbers provided in the table for the facility seem reversed. The screening values are much lower than the permit limits, many times by orders of magnitude, indicating a lack of correlation between the permit limits and the ecological risk values used in the JSCS. Please explain that discrepancy or show how the two columns of values are related to

reaching a logical conclusion on the results of the sampling.

2. Appendix C. This is a guide from the Washington State Department of Ecology, dated December 2002 (rev.1/05), and it is not clear why there is not a similar guide from ODEQ or a reference which states that this is the method adopted by the ODEQ (note that Appendix B is a City of Portland SOP for catch basin solids). Again, it seems logical in this Portland Harbor area to use the methods developed for the RI/FS, please explain why there is a different method required by the City.
3. There are some requirements in the WDOE sampling reference which do not make much sense, for example the requirement to sample for turbidity, pH, zinc, and oil and grease seem to be lacking a connection with a site and the site contaminants. Please explain the logic of such a requirement in relation to the needs for this sampling at this facility in the Portland Harbor basin area.
4. Attachment A, letter from City of Portland Environmental Services dated September 22, 2006 states that there is information from the 1996 video survey which documents a leaking joint in the pipeline (which seems to indicate a specific location). However, there is an unclear connection between the Container Recovery pipe elevation study and the Univar Facility. This is further complicated in the work plan, Section 8.5.2 which refers to Section 7.3 which indicates that there is no information as to locations where seeps could occur (was that information not in the video from 1996?). It is finally concluded that work will be done in a period of high ground water, but this may also coincide with periods of high discharge in the stormwater lines and may make this goal of visually observing the seeps difficult when that time arrives. Please clarify how these apparently conflicting statements can be reconciled to get to a conclusive set of data that will resolve the issues.
5. Attachment A, letter from City of Portland Environmental Services. It is not clear how sampling for constituents from a shared conveyance system <u>by one facility</u> will lead to a conclusion on what may be discharging from that facility. It seems that the same work should be done by all or several of the facilities in that line at the same time, or if that is not possible, have each facility sample the incoming water and the outgoing water at the upgradient and downgradient extremes in the facility stormwater lines.

8/12 26 23
9/10 21 8 30
10/7 16
11/14
12/12

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF ACRONYMS

AOC	Administrative Order on Consent
ASPP	Accidental Spill Prevention Plan
AST	Aboveground Storage Tank
BES	Portland Bureau of Environmental Services
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
COI	Contaminant of Interest
CSM	Conceptual Site Model
DCA	Dichloroethane
DCE	Dichloroethene
DCQAP	Data Collection Quality Assurance Plan
DEQ	Oregon Department of Environmental Quality
DNAPL	Dense Non-Aqueous Phase Liquid
ECSI	Oregon DEQ Environmental Cleanup Site Information
EPA	U.S. Environmental Protection Agency
EXW	Extraction Well
IBC	Intermediate Bulk Container
ICM	Interim Corrective Measure
JSCS	Joint Source Control Strategy
LNAPL	Light Non-Aqueous Phase Liquid
MC	Methylene Chloride
MDL	Laboratory Method Detection Limit
µg/L	Microgram per Liter
µg/kg	Microgram per Kilogram
MRL	Laboratory Method Reporting Limit
MSDS	Material Safety Data Sheet
NPDES	National Pollution Discharge Elimination System
OERS	Oregon Emergency Response System
OFM	State of Oregon Fire Marshal
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethane
PFB	Portland Fire Bureau
PZ	Piezometer
QA/QC	Quality Assurance / Quality Control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation

ACRONYMS (Continued)

RQ	Reportable Quantity
SMW	Shallow Monitoring Well
SPI	Stormwater Pathway Investigation
SVE	Soil Vapor Extraction
SVOC	Semi-volatile Organic Compound
SWPCP	Stormwater Pollution Control Plan
TCA	Trichloroethane
TCE	Trichloroethene
TPH	Total Petroleum Hydrocarbon
UST	Underground Storage Tank
VOC	Volatile Organic Compound
VTS	Vapor Treatment System
WP	Work Plan
WTS	Water Treatment System

1.0 INTRODUCTION

This Stormwater Pathway Investigation Work Plan (SPI Work Plan) has been prepared on behalf of Univar USA Inc. (Univar) as part of the Corrective Measures Implementation (CMI) Design at the Univar property in Portland, Oregon. The SPI Work Plan is being submitted consistent with the Final CMI Work Plan (PES 2008a) prepared pursuant to the Amendment to the Administrative Order on Consent to Implement Corrective Action 1087-10-18-3008 (AOC Amendment) dated August 1, 2007, between the U.S. Environmental Protection Agency, Region 10 (EPA) and Univar.

The SPI Work Plan describes the investigation of stormwater pathways to confirm that the final corrective measure for Univar prevents off-site migration of Univar operational materials to the Willamette River. The final corrective measure for Univar is described in detail in the Corrective Measures Study (CMS) report (PES 2006), summarized in the Statement of Basis (EPA 2006), and includes the following major components:

- Continued operation and maintenance of the existing groundwater pump and treat corrective measure;
- Expanding the existing soil vapor extraction (SVE) system in the source area;
- Source area groundwater extraction;
- Monitoring of the lower aquifer;
- Natural attenuation for groundwater;
- Engineering and institutional controls; and
- Evaluation of the potential for off-site migration of hazardous substances through the stormwater system.

1.1 Purpose

The purpose of the SPI Work Plan is to: (1) define the scope of work, (2) provide guidance for field investigation activities, (3) provide guidance for field sampling activities, (4) identify quality assurance (QA) procedures that will be implemented during sampling activities and laboratory analyses, and (5) fulfill the Environmental Protection Agency (EPA) requirements that pertain to documentation of sampling and analysis, and quality assurance/quality control (QA/QC). The SPI Work Plan generally follows the structure and guidelines presented in Oregon Department of Environmental Quality's (DEQ) Guidance for Evaluating the Stormwater Pathway at Cleanup Sites, Public Review Draft dated May 1, 2008 (DEQ 2008).

The investigation described in the SPI Work Plan will be conducted consistent with the Statement of Basis (EPA 2006), and consistent with the criteria and procedures described in EPA's and DEQ's Joint Source Control Strategy (JSCS, EPA/DEQ 2005) and draft DEQ SPI guidance (DEQ 2008). The investigation will be performed in addition to the routine stormwater monitoring and maintenance activities being conducted consistent with Univar's National Pollution Discharge Elimination System (NPDES) Waste Discharge Permit No. 101613 and Stormwater Pollution Control Plan (SWPCP, PES 2008d). Specifically, the SPI Work Plan addresses comments from the City of Portland Bureau of Environmental Services (BES) to EPA (BES 2006b) on the proposed Statement of Basis (EPA 2006). A copy of the BES letter is included in Appendix A. The BES letter identifies several chemicals that have been discovered downstream of the Univar property in both storm sewer main solids and Outfall No. 18 river sediments. It is important to note that the downstream drainage pipes and river sediments receive runoff from numerous industrial sources and the chemicals detected in those sediments cannot be assumed to have originated from Univar's property.

The results of the investigation will be submitted in a report according to the CMI Implementation Schedule included in the Final CMI Work Plan (PES 2008a). The data gathered from this investigation will be incorporated into Univar's conceptual site model (CSM; PES 2006).

1.2 SPI Work Plan Organization

The SPI Work Plan generally follows the structure and guidelines presented in draft DEQ SPI guidance (DEQ 2008). The remainder of the SPI Work Plan is organized as follows:

- **Section 2 – Background:** briefly summarizes background information for Univar including property description and history, description of Univar's operations, description of releases, description of the stormwater drainage system, and stormwater pollution control measures;

- **Section 3 – Regulatory History:** briefly describes the regulatory history and permitted activities at Univar's property associated with the stormwater pathway investigation. These activities include soil and groundwater investigation and cleanup required by EPA, permitted stormwater discharge, permitted discharge of the interim corrective measures treatment system, permitted discharge of Univar's industrial wastewater, and hazardous waste management activities associated with operations and remediation activities at the property;

- **Section 4 – Other Investigations:** briefly describes other investigations performed at the property including storm sewer inspections and soil sampling related to property improvements;

- **Section 5 – Stormwater Pathway Investigation Rationale:** presents the investigation rationale;

- **Section 6 – Chemicals of Interest:** describes the rationale for selecting the chemicals of interest based on chemicals associated with Univar operations and cleanup activities and other chemicals identified by the City of Portland required by EPA to be included in this SPI;

- **Section 7 – Existing Data and Drainage Evaluation:** presents the process for evaluating the stormwater drainage system and reviewing existing data related to the property;

- **Section 8 – Sampling and Analysis Plan:** presents the sampling and analysis plan for catch basin sediment and stormwater sampling;

- **Section 9 – Quality Assurance / Quality Control:** presents QA/QC procedures for field activities and laboratory analyses, non-conformances, and records control;

- **Section 10 – Reporting:** presents reporting requirements;

- **Section 11 – Limitations:** describes the limitations for the use of this report; and

- **Section 12 – References:** describes the references used to prepare this report.

2.0 BACKGROUND INFORMATION

This section provides a brief background discussion of Univar's operations, documented releases, and stormwater drainage and pollution control measures. For more detailed information on Univar's history, previous environmental investigations, hydrogeological conditions, the nature and extent of documented contamination, and the development and evaluation of corrective action alternatives, refer to the Statement of Basis (EPA 2006) and the Final CMS Report (PES 2006). Univar's stormwater pollution control measures are documented in the SWPCP (PES 2008d).

2.1 Description and History

Univar is located at 3950 NW Yeon Avenue in an industrial area northwest of downtown Portland, Oregon (Figure 1). The property is zoned "heavy industrial" and lies within an area designated as an Industrial Sanctuary in the City of Portland Comprehensive Plan. The property is located in the southwest quarter of the southwest quarter of Section 20 and the northwest quarter of the northwest quarter of Section 29, Township 1 North, Range 1 East. The property is located on Tax Lot 1800 at Latitude 45° 32' 55" and Longitude -122° 43' 22".

Properties near the Univar property include American Steel, McWhorter (also known as McCloskey Varnish), and the Shell (formerly Texaco) petroleum tank farm to the west; Container Recovery Inc. (formerly Convoy) and ABF/ASNR Trucking (formerly ANR) to the east and southeast; and Index and Wilhelm Trucking to the south. The area has been industrialized for approximately 60 years.

Univar has packaged, stored, and distributed bulk chemical products at the property since 1947. Bulk chemical products were formerly stored in 13 underground storage tanks (USTs), all of which were removed in 1985. At the time of removal, the tanks were tested and found to be tight.

?

Univar began recycling spent chlorinated solvents began in 1973, together with the storage of certain hazardous wastes associated with those recycling activities. The recycling and storage of associated hazardous wastes was fully discontinued in 1987 and the hazardous wastes storage area of the property underwent procedural closure under Section 3008(a) of RCRA in 1988.

2.2 Univar Operations

The property encompasses approximately 9.5 acres, including approximately 2 acres of warehouses and office space, a railroad spur, loading dock, and aboveground storage tanks (ASTs). More than 99 percent of the property is capped with buildings, the concrete loading dock area, and asphalted apron and parking areas. The property is surrounded by a chain link fence with access via two security gates at either side of the front of the property. Refer to Figures 2 and 3 for site maps and the location of property features discussed below.

how many? What is in them?

when was site paved & bldg inst.?

Univar receives, packages, stores and distributes a wide variety of industrial chemical products. The majority of which are handled in consumer end-user packaging within the interior operational areas (e.g., covered drum storage, dry packaging area, and general warehousing) that are not exposed to rain, snow, snowmelt, or runoff. These covered areas also include satellite waste accumulations and 90-day hazardous waste storage areas. Packaged chemical products are generally received along the west side of the property, and are shipped from the east side of the property with the exception of small packages, which are received and shipped from the northeast corner of the covered drum storage area.

According to the CMS report (PES 2006), Univar has also historically handled bulk solvents in the following areas: in and around the corrosive tank farm, along the rail spur from just north of the corrosive tank farm to south of the drum fill area, on the dock in and around the drum fill area, at the solvent recycle area, and in and around the solvent tank farm. Bulk chemical transfers are made from rail cars and trucks into tank storage, and intermediate bulk containers (IBC's). Direct product transfers are also made from rail cars to trucks. Rail car unloading and transfer occurs along the west side of the property along with truck transfers, loading, and unloading. Bulk chemicals delivered in tanker trucks and rail cars are stored in tanks on the southwest portion of the property. The tanks are located within secondary containment berms.

The majority of the bulk products currently handled at the property are petroleum based solvents and contain volatile organic compounds (VOCs). Univar maintains a current inventory of the storage tank contents. Table 1 lists the bulk product storage tanks, the size of the tanks, and the tank contents as of March 2008. Table 2 includes a list of bulk products handled at the property. Univar maintains a comprehensive file of material safety data sheets (MSDSs) for all chemicals handled; these MSDSs can contain additional information describing the specific chemical constituents.

2.3 Chemical Release and Incident History

Records review indicates historical releases at the property. Univar reviewed its internal records, State of Oregon Department of Environmental Quality (DEQ) records, State of Oregon Fire Marshal (OFM) records, City of Portland Fire Bureau (PFB) records, and City of Portland BES records.

The following sources of records were reviewed:

- Univar's spill records are documented in the Accidental Spill Prevention Plan (ASPP, Univar 2006). According to the ASPP, reportable quantity (RQ) spills are reported to DEQ through the Oregon Emergency Response System (OERS). Univar follows state and federal guidance for defining RQ spills and reporting procedures. Other than the list in the ASPP, Univar does not maintain historical records of reportable spills.

- Information posted on the DEQ Environmental Cleanup Site Information (ECSI) webpage for Univar: http://www.deq.state.or.us/lq/ECSI/ecsidetailfull.asp?seqnbr=330.

- A telephone interview with Ms. Kimberly Van Patten of OERS on May 22, 2008 which indicated that there are no records of RQ spills or incidents at 3950 NW Yeon Avenue, Portland, Oregon, 97210 since 1999. Ms. Van Patten did not have access to records prior to 1999 and indicated that Mr. Ray Hoy at the DEQ NW Regional Office may have access to these records.

- A telephone interview with Mr. Ray Hoy of DEQ on May 23, 2008 which indicated that there are no records of RQ spills or incidents at 3950 NW Yeon Avenue since 1999. Mr. Hoy said that he would research the files for available records prior to 1999. No additional information has been made available by DEQ at the time of writing this report.

- Information posted from the OFM incident response database for 3950 NW Yeon Avenue was reviewed online at the following website: http://www.oregon.gov/OSP/SFM/CR2K_Incident_Database.shtml. The database includes records from 1986 through 2004.

- A telephone interview with Mr. Mark Bunster of the PFB on May 28, 2008 which indicated that there are no records of hazardous materials response or chemical spills at 3950 NW Yeon Avenue since 1998. Mr. Bunster indicated that he did not have access to records prior to 1998.

- Review of BES file records since 1991 did not indicate any chemical spills at the property.

The spill and incident records maintained at the property and the various agencies are generally consistent and complementary. Releases of the following chemicals are documented in the records listed above: methylene chloride (MC), trichloroethene (TCE), 1,1,1-trichloroethane (TCA), toluene, acetone, nitric acid, phosphoric acid, and 15-5-9 surfactant. OERS records also list an incident involving 0 gallons of aqua ammonia, but do not provide any additional data.

Figure 4 shows the general location of the three documented releases of solvents as reported by the RCRA Facility Investigation (RFI) Report (HLA 1993). This figure was presented as Figure 2-11 in the CMS report (PES 2006) to show the approximate location of high concentrations of volatile VOCs in soil and soil vapor as well as approximating the area of source contamination based on locations of documented solvent releases and subsurface VOC contamination. Further discussion of subsurface contamination and cleanup activities is presented in Section 3.1.

2.4 Stormwater Drainage

Precipitation falling within the Univar property is collected by a series of catch basins and roof drains located throughout the property (Figure 3). The catch basins route water through underground stormwater conveyance lines and manholes, to storm sewer mains operated, owned, and maintained by the City of Portland. Stormwater runoff from building roof tops is also collected by the City storm sewer mains via underground stormwater conveyance lines.

The drainage map (Figure 3) and Table 3 describes the drainage areas, storm drain system, and sampling points. Six general stormwater drainage basin areas have been defined based on the existing grading, stormwater sewer system, and catch basins. Drainage Area Nos. 1, 2, 3, 4, and 6 are connected to the City of Portland owned and maintained 42-inch storm sewer main on the east side of the property; the 42-inch storm sewer main flows to the north which then connects to another 42-inch storm sewer main which flows to the northwest and is located in the frontage road adjacent to NW Yeon Avenue. Drainage Area No. 5 is connected to the City of Portland owned, operated, and maintained 8-inch storm sewer line on the American Steel property which flows to the southwest. Both of these City owned, operated, and maintained storm sewer mains ultimately discharge to the Willamette River via Outfall No. 18. There are no known areas of stormwater run-on to the Univar property from adjacent properties. However, both the 42-inch and 8-inch City owned, operated, and maintained storm sewer mains convey stormwater from adjacent and nearby properties.

With the notable exception of the City owned, maintained and operated 42-inch stormwater main which is located within an easement (granted by Univar to the City of Portland) along Univar's eastern property boundary, Univar maintains the stormwater drainage system on its own property. Hereinafter this will be called the "Univar maintained stormwater drainage system" which specifically excludes the City owned, operated and maintained stormwater main located along the eastern property boundary. The Univar maintained stormwater drainage system includes roof drains, catch basins, stormwater conveyance piping, manholes, and emergency shut-off valves. At the writing of this report is unclear as to whether the Univar maintained stormwater drainage system is owned by Univar or the City of Portland.

The central and southern portions of the property are the primary areas of industrial activity where the main product handling and storage operations are located. These areas are serviced by Drainage Area Nos. 1, 2, 3, and 4.

- Drainage Area No. 1 - Approximately 64,100 square feet of impervious surfaces including the southern half of the rail spur, drum fill area, and solvent tank farm area;
- Drainage Area No. 2 – Approximately 107,300 square feet of impervious surfaces including the eastern drive, covered drum storage structures, and the eastern half of the warehouse;
- Drainage Area No. 3 - Approximately 65,900 square feet of impervious surfaces in the center of the property including the corrosive tank farm and the central rail spur; and
- Drainage Area No. 4 – Approximately 105,200 square feet of impervious surfaces at the southern end of the property including the remediation building.

The final two drainage areas service the northern portions of the property only limited product handling activity occurs.

- Drainage Area No. 5 – Approximately 35,300 square feet of impervious surface west of the warehouse that is used for truck unloading to the warehouse and employee parking; and
- Drainage Area No. 6 - Approximately 39,800 square feet of impervious surface at the northern end of the property that is generally used for worker vehicle parking.

Discussion of stormwater sampling and stormwater pollution control measures is described in Section 3.3.

3.0 REGULATORY HISTORY

Univar operates within the rules and guidelines of local, state, and federal regulations. Since the SPI Work Plan is limited to the investigation of stormwater pathways to confirm that the final corrective measure for Univar prevents off-property migration of contamination to the Willamette River, the discussion of regulatory history will be limited to the following topics:

- Resource Conservation and Recovery Act (RCRA) cleanup related activities under Section 3008(a) of RCRA as required by EPA Region 10 consistent with the provisions of the Administrative Order on Consent (AOC) dated June 15, 1988 (EPA 1988) and Amendment to the AOC to Implement Corrective Action 1087-10-18-3008 (AOC Amendment) dated August 1, 2007 (EPA 2007).
- Non-stormwater discharge monitoring for treated groundwater from the Interim Corrective Measure (ICM) groundwater extraction and treatment system in accordance with NPDES Waste Discharge Permit No. 101613 (DEQ 2004).

- Stormwater discharge monitoring in accordance with National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit No. 101613.
- Wastewater discharge monitoring in accordance with City of Portland BES Industrial Wastewater Discharge Permit No. 400.025 (BES 2006a).
- Hazardous Waste Management.

Consistent with draft DEQ SPI guidance (DEQ 2008), the SPI Work Plan includes summaries of historical chemistry data and comparison of sample results to screening level values (SLV) published in the guidance. This comparison is used to help develop specific contaminants of interest (COI) associated with Univar operations and cleanup activities for evaluation in the stormwater pathway investigation. According to the JSCS (EPA/DEQ 2005) SLVs are used by DEQ to assess threats to the Willamette River from potentially complete contaminant migration pathways (e.g., soil, stormwater, groundwater) from upland sources. The JSCS has clarified that an SLV exceedance(s) does not necessarily indicate that an upland source of contamination poses an unacceptable risk to human or ecological receptors, but rather that it requires further consideration of source control using a weight-of-evidence evaluation.

3.1 RCRA Cleanup Activities

Univar began recycling spent chlorinated solvents in 1973 along with the storage of certain hazardous wastes associated with recycling activities. The recycling and storage of associated hazardous wastes was discontinued in 1987. In July 1986, EPA issued a Unilateral Order to Van Waters and Rogers (Univar's predecessor in interest) under Section 3013 of RCRA to conduct an investigation of soil and groundwater at the property. EPA terminated the Unilateral Order in April 1988 and the hazardous waste storage facility underwent procedural closure under Section 3008(a) of RCRA as required by EPA Region 10 consistent with the provisions of the AOC dated June 15, 1988 (EPA 1988). The provisions and requirements of the AOC, along with other relevant RCRA regulations and guidance, provided the basis for all environmental activities including investigation activities, interim corrective measures (ICMs), and the performance of the CMS (PES 2006).

The initial field investigations were documented in the RFI report (HLA 1993) submitted under the original 1988 AOC. These investigations included installation of soil boring and groundwater monitoring wells, and collection and analysis of soil and groundwater samples. Univar implemented quarterly and semiannual groundwater monitoring programs which are ongoing. Constituents that were detected in soil included: PCE, TCE, TCA, 1,2-dichloroethene (1,2-DCE) vinyl chloride, and MC. Constituents detected in groundwater included benzene, toluene, ethyl benzene, xylene, PCE, TCE, DCE, TCA, vinyl chloride, and MC.

Since the 1993 RFI report, Univar has performed supplementary site characterizations, ICM design and implementation work, deep aquifer evaluations, regional groundwater survey, and completed the CMS report as required by the original 1988 AOC. After completion of the requirements of the original AOC, and in particular the preparation and approval of the CMS report, EPA prepared a Statement of Basis (EPA 2006) that described the proposed corrective measure selected for implementation by EPA. At the completion of the public review period, EPA issued a final decision letter dated September 29, 2006. EPA also issued an Amendment to the AOC to Implement Corrective Action 1087-10-18-3008 (AOC Amendment) dated August 1, 2007 (EPA 2007). The amended AOC provided the basis for performing the CMI which also includes this SPI Work Plan.

3.1.1 Historical Soil and Groundwater Sampling

In the CMS report and Statement of Basis, Univar identified 23 chemicals of concern (COC) in soil and groundwater based on human health risk exposure pathways (i.e., inhalation, dermal contact, ingestion). The COCs include 21 VOCs and 2 semi-volatile organic compound (SVOC) polycyclic aromatic hydrocarbons (PAH). Univar developed the COC list based on historical operations, identified spills/releases, environmental sampling results, and ICM monitoring.

Table 4 lists the concentrations of COCs that have been detected in shallow soil and groundwater, and published SLVs for evaluating the stormwater pathway at cleanup sites. Table 4 also includes concentrations of detected VOCs and SVOCs which are not listed as COCs in the CMS report, and has incorporated draft results of COCs and non-COCs that were discovered in soil sampling performed in April 2008 in accordance with the in CMI Design Investigation Work Plan (DIWP, PES 2008b). The draft soil results from the CMI design investigation will be finalized and included in the next progress report scheduled to be submitted in July 2008.

In general, soil and groundwater samples collected for the RFI report were analyzed by EPA Methods 8010, 8020, and 8240. More recently collected soil and groundwater samples were analyzed by EPA Method 8260.

How deep are storm lines?

Soil Data. The soil data presented in Table 4 includes data from samples collected within the top 15 feet below ground surface (bgs) as this shallow zone is important to the evaluation the groundwater to stormwater pathway.

What is depth range of GW table?

For the purposes of initial screening, soil concentrations listed in Table 4 are based on highest soil concentrations published in the RFI report, CMS report and draft soil results from the CMI design investigation. It should also be noted that historical soil sampling associated with RCRA cleanup activities has been conducted mainly in the areas of historical spills and releases and not near the perimeter of the property near the 42-inch storm sewer mains. Of the 23 COCs identified in the CMS Report, only three COCs have been assigned SLVs by DEQ: indeno(1,2,3-cd)pyrene, tetrachloroethene (PCE), and TCE.

Groundwater Data. For the purposes of initial screening, groundwater concentrations in Table 4 are based on the highest shallow monitoring well concentrations published in the fourth quarter 2007 and first quarter 2008 progress reports (PES 2007, 2008c).

Two sets of groundwater concentrations are presented: concentrations in all wells, and concentrations in only those wells adjacent to the 42-inch stormwater mains running along the eastern property boundary and in the NW Yeon Avenue frontage road. These wells include shallow groundwater monitoring wells SMW-3, -9, -10, -11, 16, -17, -18, -21, -23, -24, and -27;

Which are the 2 adjacent to SW main?

all by SW main

shallow piezometers PZ-3 and -9; and shallow groundwater extraction well EXW-4A (Figure 5). The groundwater concentrations in wells adjacent to 42-inch storm mains exceed SLVs for only two COCs: vinyl chloride and TCE. In addition, no sampling in groundwater has been done for two of the COCs - indeno(1,2,3-cd)pyrene and benzo(b)fluoranthene – due to the limited mobility of these compounds and extremely low likelihood of transfer from shallow soil concentrations to groundwater. ?

3.2 Interim Corrective Measures

In accordance with the original 1988 AOC, Univar has implemented a number of ICMs beginning in 1992 with a pilot-scale SVE system. A groundwater ICM, consisting of three groundwater extraction wells, was installed during late 2001 and early 2002. The groundwater ICM began operations in March 2002. The groundwater ICM provides hydraulic control of the groundwater contamination at the north and south ends of the plume perimeter as well as removes contaminant mass. The extracted groundwater is treated by air stripping. Treated groundwater is then collected by the City of Portland's owned and operated 42-inch diameter stormwater main near the eastern property boundary via catch basin CB-4D (Figure 3) under NPDES Waste Discharge Permit No. 101613. Why is this an NPDES permit? Permit should be for OF 18 & City permit internal discharges.

OF-18 had treated ind. water — not just SW

The ICM system currently includes an SVE system consisting of six SVE wells and four groundwater extraction wells. The SVE vapors and air stripper off-gases are combined and treated in a common vapor phase treatment system. Results of current ICM activities are presented in the most recent quarterly progress reports submitted by Univar to EPA (PES 2007, 2008c).

Why is ind. WW being disch. to SW line?

3.2.1 Historical Sampling Results

why CN?

Monthly compliance monitoring samples are collected from the WTS discharge and analyzed for VOCs, cyanide, oil and grease, and pH. In Univar's entire operating history, VOCs have been detected only ten (10) times and exceeded discharge limits only twice. Cyanide although detected six (6) times has never exceeded discharge limits and oil & grease detected two (2) times has likewise never exceeded discharge limits. VOCs detected in WTS discharge samples has included PCE, TCE, TCA, 1,2-DCE, 2-butanone (MEK), ethylbenzene, toluene, m,p-xylenes, and o-xylenes. However, VOCs have exceeded their respective permitted discharge limits only two times: August 2002 (1,2-DCE) and May 2005 (TCA and PCE). Each of the VOC discharge exceedances was attributed to a malfunction of the former resin adsorption vapor treatment system (VTS) and there have been no VOC detections in WTS discharge since the resin adsorption VTS was replaced in the summer of 2006.

how frequently monitored?

For the purposes of initial screening, Table 5 lists the permitted discharge limits, the range of historical VOC detections in WTS discharge, and published SLV for evaluating the stormwater pathway at cleanup sites (DEQ 2008). Table 5 also documents the number of times each VOC has been detected in the entire ICM operating history.

When was 1st permit issued? Have limits stayed same since?

3.3 Stormwater Discharge

Univar's stormwater pollution control measures are documented in the SWPCP (PES 2008d) that has been prepared consistent with the NPDES Waste Discharge Permit No. 101613. The discharge permit was originally obtained by Univar in 1998 and renewed in 2004. The NPDES permit required stormwater monitoring and indicated that a SWPCP should be prepared for the property. The SWPCP works in conjunction with Univar's ASPP (Univar 2006) and Contingency Plan (Univar 2005) and is written consistent with the requirements of DEQ's 1200-Z General Permit in effect in 2004 and was recently updated to address comments from the City of Portland (BES 2008) following up on its annual stormwater inspection conducted in February 2008.

3.3.1 Historical Sampling Results

Univar has been sampling the three discharge points two times per year (Figure 3) starting in the 1999/2000 rainy season. Typically, the first sample is collected in autumn when runoff first occurs and the second sample is collected at least 60 days later. Samples are analyzed for the parameters listed in the discharge permit.

Table 6 includes a summary of all sample results, waste discharge permit benchmark levels, and published SLV for evaluating the stormwater pathway at cleanup sites (DEQ 2008).

It's unclear how these are all linked.

3.4 Industrial Wastewater Discharge

→ pretreatment permit? Is this discharged to same 42" pipe as SW?

Univar discharges industrial wastewater in accordance with City of Portland BES Industrial Wastewater Discharge Permit No. 400.025 (BES 2006a). The industrial wastewater discharge permit works in conjunction with Univar's ASPP (Univar 2006) to define the specific practices and parameters for batch discharge of industrial wastewater from the neutralization area to the City's sanitary sewer pursuant to the permit (Figure 3).

The permit allows Univar to batch discharge industrial wastewater twice per day between the hours of 8:00 am and 10:00 am and 1:00 pm and 3:00 pm, and requires pH monitoring on a per-batch basis prior to discharge. Univar performs pH adjustment using hydrochloric acid or sodium hydroxide to bring the batch pH within discharge limits (5.0 – 11.5 pH units). According to the DEQ ECSI database, there were a series of low pH discharges in 1984 and 1985 (0.8 to 3.2 pH units). According to the industrial wastewater discharge permit, there are only two violations of pH on record and no violations recorded during BES monitoring.

The industrial wastewater discharge permit lists the following materials potentially present in the waste stream: hydrochloric acid, phosphoric acid, sulfuric acid, formic acid, nitric acid, sodium hydroxide, potassium hydroxide, ammonium hydroxide, sodium hypochlorite, aluminum sulfate liquid, and triton 9-n-9 (i.e., surfactant). Table 7 lists the permit required discharge limits as wells as other chemicals that have been historically detected in the industrial wastewater, but not in quantities greater than 1 mg/L (on average). In general, the draft DEQ SLVs (DEQ 2008) are less than the permitted discharge concentrations listed in the industrial wastewater Discharge Permit No. 400.025.

3.5 Hazardous Waste Management

Univar is listed as a large quantity generator of hazardous waste. Review of historical hazardous waste disposal records from 1992 through 2007 indicates a variety of hazardous waste materials properly disposed of off-site. A summary of the hazardous waste generation reporting history for the property has been prepared by DEQ and can be reviewed on their website: http://deq12.deq.state.or.us/FP20/Fpdetail.aspx?SiteID=1053.

4.0 ADDITIONAL INVESTIGATIONS

In addition to the RCRA related environmental investigations discussed in Section 3.0, other investigations related to Univar's operations and improvements have been performed. This section describes these addition investigations.

4.1 Storm Sewer Inspections

According to City of Portland BES records, the City owned and operated 42-inch storm sewer main along the eastern property boundary has been historically sampled and inspected. Additionally, in 1996 Univar conducted an inspection of the 42-inch storm sewer main at the request of DEQ and the City of Portland to assess the structural integrity of approximately 1,400 feet of the storm main. The inspection is documented in the storm sewer inspection field report (HLA 1996).

Univar initially undertook only a video inspection of the City owned and operated 42-inch storm sewer main located within the easement on the Univar property. However the City sewer system was clogged with sediments and Univar was required to jet the line prior to finalizing the required video inspection. Waste characterization sampling of the sediments indicated the presence of PCE, TCE, cis-1,2-DCE, ethylbenzene, toluene, and total xylenes. Table 8 includes the sediment data from the line jetting, and published SLVs for evaluating the stormwater pathway at cleanup sites (DEQ 2008).

It is important to note that this City owned and operated 42-inch stormwater pipeline drains stormwater from a large area both upgradient and downgradient of Univar. This drainage area includes numerous other industrial facilities that are likely to be potentially significant sources of stormwater contamination.

The inspection revealed several broken, chipped, and pulled joints, and indicated that the joint separation was minor as several inches of the 4-inch long bell fittings were still fitted together. The inspection field report also noted areas of discolored piping and joints.

The inspection also revealed that the City's storm sewer line had a sagging section where approximately 12-inches of sediment and water collected in that section of the line. Otherwise, the City's 42-inch storm sewer main appeared in good condition with no structurally suspect areas and no deterioration of the interior pipe surface. There were no indications that the sediment buildup in the City's stormwater main originated from the Univar property. The inspection is documented in the storm sewer inspection field report (HLA 1996). How could there be indications other than same chem?

4.2 Soil Sampling for East Drive Re-Paving

Univar has performed three rounds of soil sampling in 2002, 2007, and 2008 to characterize shallow soils that have been or may be (in the future) removed during repaving of the eastern driveway between the eastern loading dock and the eastern property line. The soil sampling identified low levels of certain metals, VOCs, pesticides, pentachlorophenol, and total petroleum hydrocarbons (TPH). This data was collected for internal waste characterization and has not been published elsewhere. please provide [104(e)]

For the purposes of screening, Table 9 includes a list of the highest concentration of detected analytes and published SLVs for evaluating the stormwater pathway at cleanup sites (DEQ 2008). Analytes that were not detected above laboratory MRLs are not included in Table 9. A comparison of detected analytes and SLVs includes the following:

- Metals – All detected metals concentration were less than SLVs with the exception of lead.
- Organochlorine Pesticides – All detected pesticides were greater than the SLVs.
- VOCs – PCE and TCE were above SLVs. Draft DEQ SPI guidance does not list SLVs for the remaining VOCs detected in soil samples.
- SVOCs – Pentachlorophenol was the only detected SVOC and was well below the SLV. The laboratory MRLs were typically below SLVs.
- TPH – Diesel range and oil range TPH organics were detected in several locations. Draft DEQ SPI guidance does not list SLVs for TPH.

It should be noted that shallow soil samples were also analyzed for chlorinated herbicides and there has not been any detection of chlorinated herbicides above the laboratory MRLs.

5.0 STORMWATER PATHWAY INVESTIGATION RATIONALE

As defined by the EPA's Statement of Basis (EPA 2006) the SPI is intended to confirm that the corrective measures Univar has implemented are preventing any potential migration of any alleged contamination from Univar's activities to the Willamette River via the City's storm sewer system. The SPI Work Plan includes the following major components:

- An evaluation of the potential for contaminants to be released to the stormwater system from the Univar property and development of potential contaminants of interest (COI);

- Delineation of drainage basins, stormwater collection systems, stormwater lines;

- Sampling of the stormwater system including collecting catch basin sediment samples and collecting whole water stormwater samples; and

- Evaluation of whether contaminated groundwater could enter the stormwater system.

5.1 Evaluation of Potential Contaminants

The potential COIs include materials that have the potential to migrate from Univar's property to the Willamette River. A list of potential COIs are developed in Section 6.0 from the following two categories of chemicals:

- Products associated with Univar's operations and cleanup activities that may migrate into the City's storm sewer; and

- Chemicals identified by the City of Portland alleged to have been discovered downstream of the Univar property in stormwater conveyance pipes and/or in Willamette River Outfall No. 18 sediments (BES 2006b).

The two categories of chemicals will be compared to the list of chemicals in the draft DEQ stormwater pathway evaluation guidance (DEQ 2008), and the chemicals common to both will be retained for evaluation in future stormwater and catch basin sediment sampling and analysis. These retained chemicals will be defined as the COIs. Refer to Section 6.0 for further discussion.

5.2 Drainage System Delineation

The stormwater system on Univar's property will be thoroughly investigated. This task will include a review of existing records related to stormwater drainage and COIs and coordinating a survey of accessible stormwater drainage structures, cataloging catch basin and manhole data (i.e., dimensions, static water height, pipe size, etc.), evaluating drainage basin boundaries, and inspecting the stormwater system for non-stormwater or off-property stormwater infiltration.

The information presented in the existing 1996 boundary survey map will be updated to include stormwater conveyance pipe sizes and elevations, the stormwater drainage map (Figure 3) will be updated, and a catch basin and manhole data table will be generated. Additionally, a video survey of the Univar maintained stormwater drainage system will be conducted to document current conditions. Locations of disrepair and potential groundwater infiltration will be documented for possible further evaluation. Refer to Section 7.0 for further discussion.

5.3 Catch Basin Sediment and Stormwater Sampling

A sampling and analysis plan (SAP) has been prepared for stormwater and catch basin sediment sampling during the 2008/2009 water year. Catch basin sediments will be sampled twice: the first sampling event will be conducted prior to the 2008/2009 rainy season, and the second sampling event will be conducted after the rainy season. A minimum of four stormwater sampling events will be conducted during the 2008/2009 rainy season. Samples will be submitted to an analytical laboratory for analysis of the COIs. The stormwater sampling will be conducted concurrent with the routine SWPCP sampling (PES 2008d).

during?

Summer 08 & Summer 09 ? to compare.

grabs or ? composites

The sample results will be compared to SLVs listed in Appendix D of the draft DEQ SPI guidance (DEQ 2008) and summarized. Univar will eliminate potential COIs from the SPI evaluation if they are below laboratory MRLs and/or detected below SLVs in catch basin sediment and stormwater samples, not handled in bulk at the property, not handled outside of the warehouse at the property, and not sampled for under the current groundwater and stormwater monitoring programs. Analytes with concentrations above DEQ SLVs will be retained for further evaluation. Refer to Section 8.0 for further discussion.

5.4 Evaluation of Groundwater to Stormwater Pathway

why not look for base flow?

The groundwater to stormwater pathway will be evaluated by plotting groundwater elevations relative to property and City of Portland stormwater conveyance pipe invert elevations. Sections of conveyance piping in disrepair or potential groundwater infiltration (as discovered by the video survey) will be examined for evidence of groundwater infiltration to the Univar maintained stormwater drainage system. During periods of high shallow groundwater elevations, additional video inspection will be performed to document any potential groundwater infiltration. If significant groundwater infiltration is observed to the Univar maintained stormwater drainage system, Univar will prepare a supplemental sampling plan. Refer to Section 7.3 for further discussion.

6.0 CHEMICALS OF INTEREST

This section identifies the COIs that will be evaluated by the SPI Work Plan. COIs evaluated for the SPI Work Plan are specific chemicals or categories of chemicals that have the realistic potential to enter the City of Portland storm sewer system. As noted previously, the list of potential COIs is being developed from the following two categories of chemicals:

- Products associated with Univar operations and cleanup activities that may migrate into the City's storm sewer; and
- Chemicals identified by the City of Portland that have been discovered downstream of the Univar property in stormwater conveyance pipes and/or in Willamette River Outfall No. 18 sediments (BES 2006b).

Only those chemicals listed in the draft DEQ SPI guidance for evaluating the stormwater pathway at cleanup sites (DEQ 2008), related to historical operations and cleanup activities, identified by the City of Portland (BES 2006b), and are reasonably likely to reach the Willamette River through stormwater outfall 18 will be retained in the SPI Work Plan. These retained chemicals will be defined as the COIs.

6.1 Chemicals Associated with Univar Operations and Cleanup Activities

This section summarizes the chemicals associated with Univar operations and cleanup activities and provides the rationale for selecting chemicals to be included as COIs. As described earlier, there are several chemicals associated with historical operations and cleanup activities.

6.1.1 Historical Spills and Releases

As described in Section 2.2 and 2.3, there have historically been relatively few chemical spills and incidents at the property. These chemicals spilled include TCE, TCA, toluene, methylene chloride, acetone, nitric acid, phosphoric acid, and surfactant. Only TCE, TCA, toluene, methylene chloride, and acetone are listed in draft DEQ SPI guidance, and are thus retained as COIs. Nitric acid, phosphoric acid, and surfactants are not retained.

6.1.2 RCRA Cleanup Activities Section 3.1.1 – 21 VOCs & 2 SVOCs

As described in Section 3.1, 29 VOCs and 5 SVOCs were detected in soil and groundwater samples that were collected as part of RCRA remediation activities are considered (see Table 4). All 29 VOCs and 5 SVOCs are either listed as COCs in the CMS report (PES 2006) and/or are listed in draft DEQ SPI guidance and are thus retained as COIs.

6.1.3 Non-Stormwater Discharge Monitoring

As described in Section 3.2, chemicals associated with permitted non-stormwater discharge sampling of the ICM WTS are considered. These include the chemicals and parameters listed in the permit (10 VOCs, cyanide, oil and grease, and pH), and 5 other VOCs that have been historically detected are considered (see Table 5). Since the WTS discharges directly to the City owned and maintained storm sewer system, all 15 VOCs, cyanide, oil and grease, and pH are retained as COIs.

6.1.4 Stormwater Discharge Monitoring

As described in Section 3.3, chemicals and parameters associated with stormwater discharge sampling including copper, lead, zinc, TSS, oil and grease, and pH are considered (see Table 6). These chemicals and parameters are retained as COIs since this water directly discharges to the City owned and operated stormwater conveyance system.

6.1.5 Wastewater Discharge Monitoring

As described in Section 3.4, chemicals and parameters associated with permitted industrial wastewater discharge from Univar's neutralization area including 11 metals, 7 VOCs, 5 SVOCs, chlordane, sulfide, sulfate, ammonia, cyanide, oil and grease, and pH are considered (see Table 7). The City of Portland BES has suggested that since these chemicals are associated with Univar's operations and are present in industrial wastewater discharge, the chemicals may also be present in stormwater discharged from the property (BES 2006b). The City's implication is incorrect since as a result of Univar's housekeeping and chemical handling practices (i.e., dedicated piping and extensive use of drip pans it is unreasonable to assume that chemicals present in industrial wastewater discharge will also be present in stormwater discharged from the property. Additionally, because the neutralization area is directly plumbed to the sanitary sewer, there is almost no potential for actual industrial wastewater to enter the storm system. In order to address BES' concerns only those chemicals that are both identified in the industrial wastewater discharge permit and ~~listed in~~ draft DEQ SPI guidance are retained as COIs. Thus molybdenum, sulfide, sulfate, and ammonia are not retained.

6.1.6 Storm Sewer Inspections

As described in Section 4.1, chemicals detected in sediment samples associated with the 1996 line jetting of the City owned and operated 42-inch storm sewer main that runs alongside Univar's eastern property boundary are considered (see Table 8). The chemicals detected in sediment samples associated with cleaning of the 42-inch storm sewer main - PCE, TCE, cis-1,2-DCE, ethylbenzene, toluene, and xylenes – are all retained as COIs.

6.1.7 Property Improvements Soil Sampling

I would only keep lead

As described in Section 4.2, chemicals detected in shallow soil samples in the eastern driveway are considered (see Table 9). The chemicals detected in shallow soil samples include 5 metals, 7 organochlorine pesticides, 9 VOCs, pentachlorophenol, and TPH. Since potentially exposed soil in the eastern driveway has the possibility of entering the storm sewer system during storm events, all chemicals detected in shallow soil samples, except barium, are retained as COIs. Barium is not retained because this metal is not listed in draft DEQ SPI guidance and there is no known source of this metal related to Univar's operations.

are there known sources of other metals? lead & copper maybe, but others?

6.2 Chemicals Identified by the City of Portland

The City of Portland has identified metals, VOCs, SVOCs, phthalates, polychlorinated biphenyls (PCBs), pesticides, TPH, and total organic carbon (TOC) as COIs that have been discovered downgradient of the Univar property in stormwater conveyance pipes and/or in Willamette River Outfall No. 18 sediments (BES 2006b). These chemicals, except for TPH and TOC, are included in the list of screening chemicals in the draft DEQ SPI guidance (DEQ 2008). All of the chemicals and parameters identified by the City of Portland will be retained as COIs for the SPI since they are all directly related to stormwater quality at Outfall No. 18 and the City, DEQ and EPA have required that we so include them.

It is important to note that the downstream drainage system and river sediments receive runoff from numerous industrial sources and the chemicals detected in those sediments cannot be assumed to have originated from the Univar property. may not be sole source, but still may be source => contribution

6.3 Summary of Retained COIs

Only those chemicals that are listed in the draft DEQ SPI guidance for evaluating the stormwater pathway at cleanup sites (DEQ 2008), related to historical operations and cleanup, and identified by the City of Portland (BES 2006b) will be retained as COIs in the SPI Work Plan. Based on the potential sources described in Sections 6.1 and 6.2, the following COIs are retained.

- The following metals listed in Appendix D of the draft DEQ SPI guidance (DEQ 2008): aluminum (Al), antimony (Sb), arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), manganese (Mn), mercury (Hg), nickel (Ni), selenium (Se), silver (Ag), and zinc (Zn).
- The standard suite of PCB Aroclors reported on the EPA Method 8082 list; we are looking @ congeners, not Aroclors
- The standard suite of organochlorine pesticides reported on the 8081A list;
- which ones? Select VOCs that are associated with historical operations and cleanup activities and reported on the EPA Method 8260b list;
- The standard suite of SVOCs reported on the EPA Method 8270C list;
- Cyanide; => where is the CN in their operation
- Oil and Grease;
- TPH;
- TSS;
- TOC;
- Grainsize analysis (sediment only); and
- pH.

Table 10 includes the laboratory analytical methods. Table 11 includes laboratory reporting limits, and SLVs (DEQ 2008). Chemicals and parameters which are known to be related to Univar's operations, property improvements, or RCRA cleanup actions are bolded and highlighted in Table 11.

6.4 Additional Chemicals of Interest

If additional chemicals are discovered to have the potential to impact stormwater discharge from the Univar property, these chemicals will be added to the list of COIs.

7.0 EXISTING DATA REVIEW ANDSTORMWATER DRAINAGE EVALUATION

The Univar maintained stormwater drainage system and the two nearby sections of City owned and operated 42-inch stormwater mains will be investigated to gain a thorough understanding of current state of these stormwater drainage features and the potential for COIs to ultimately be deposited in the Willamette River. The specific City owned stormwater mains that will be investigated include: (1) the 42-inch main in the easement along Univar's eastern property boundary and (2) the 42-inch main in the NW Yeon Avenue frontage road adjacent to the Univar's northern property boundary.

This task includes reviewing existing data related to stormwater drainage, investigating and surveying the Univar maintained stormwater drainage system, performing wet-season and dry-season inspections, and documenting the potential for groundwater infiltration to the stormwater conveyance system.

If the review of existing data and the drainage evaluation indicate additional potential stormwater pathways for COIs to the Willamette River, Univar will incorporate this new information into the work scope and submit a work plan addendum to EPA.

7.1 Existing Data Review

As described in Section 2.0, some of the existing records have already been reviewed as part of the SPI Work Plan preparation including Univar records, DEQ records, State OFM records, PFB records, and BES records. Additional records will be reviewed as they relate to the stormwater drainage system and COIs. These records include, but are not limited to the following.

- City of Portland stormwater conveyance system maps and records of conveyance piping solids sampling;
- Review of the 1996 property boundary survey records;
- Review adjacent property owner information regarding the relative elevations of the City owned and maintained 42-inch stormwater conveyance mains. located in the easement near Univar's eastern property line (BRI 2004);

Univar will summarize the data review findings in the SPI report. If additional records or documents are discovered during the data review process, these documents will be also be reviewed and summarized.

7.2 Drainage System Evaluation

This task includes the following activities to help Univar gain a more thorough understanding of the Univar maintained stormwater drainage system.

- Inspect all accessible stormwater drainage features to determine the condition of each catch basin and manhole within the property boundary. Record Univar's operating activities in the vicinity of each catch basin. Document dimensions, rim elevations, inlet/outlet pipe invert elevations, pipe alignment, pipe sizes, static water height, sediment thickness, evidence of clogging, staining, presence of debris, and estimated catchment area. Stormwater catch basins, manholes, and pipe inverts will be surveyed by a licensed surveyor and elevations will be reported to the City of Portland datum, consistent with previous surveys at the property.

- Conduct a video survey of the Univar maintained stormwater discharge system. . Document areas of disrepair and areas of potential groundwater infiltration for further evaluation (see Section 7.3). If cleaning and flushing is required, Univar will prepare a supplemental scope for EPA review.

- Confirm the stormwater drainage map by performing a wet-season and dry-season inspections. Update the drainage map (Figure 3) and drainage basin description as required (Table 1). Document areas of non-stormwater flow and run-on from adjacent properties off-site into the Univar maintained stormwater drainage system. If non-stormwater flow or run-on is observed to be potentially infiltrating a stormwater sampling point or catch basin sediment sampling point, the sampling point may not be a representative sampling location and EPA will be contacted to discuss alternative sampling locations. Refer to Section 8.0 for description of stormwater sampling locations.

The results of the stormwater drainage system evaluation will be documented on revised stormwater drainage map. Catch basin and manhole documentation will be tabularized, and a catch basin sampling table will be prepared per draft DEQ SPI guidance (DEQ 2008). In addition, the results of the stormwater drainage system evaluation will be used to select representative locations for catch basin sediment sampling. Catch basin sediment sampling is further described in Section 8.3.

7.3 Groundwater to Stormwater Pathway Investigation

The groundwater to stormwater pathway will be investigated by comparing groundwater elevations relative to stormwater conveyance piping elevations. The areas of investigation will include the following:

- The Univar maintained stormwater drainage system;

- The City owned and operated 42-inch stormwater main located within the easement on Univar's eastern property boundary; and

- The City owned and maintained stormwater main located north of Univar in the NW Yeon Avenue frontage road.

Should look for base flow during insp of manholes & catch basins & line surveys

This should also be done for site SW syst.

Seasonal high shallow groundwater elevations will be plotted relative to pipe elevations to define areas of potential groundwater infiltration. Pending permission from the City of Portland, these areas will be video inspected during periods of high shallow groundwater elevations (i.e., typically April or May to document potential evidence of actual groundwater infiltration.

Since the location(s), if any, and site conditions of potential groundwater infiltration is not known at this time, Univar is not able to prepare focused a sampling and analytical plan for groundwater infiltration sampling. Therefore, if groundwater infiltration is observed, Univar will submit a supplemental work plan to EPA prior to performing additional work.

8.0 SAMPLING AND ANALYSIS PLAN

The field procedures will be performed in general accordance with previously approved sampling and analysis/quality assurance project plans (HLA 1989, ITC 2001). The SPI Work Plan includes these procedures, as applicable, and provides supplemental information specific to this work. Equipment and materials used in the work are provided in Table 12, which is consistent with the equipment and materials listed in previously approved plans (Table 1; ITC 2001) and those listed in Appendix D of the JSCS (EPA/DEQ 2005).

8.1 Sampling Needs and Objectives

Within the Univar maintained stormwater drainage system, catch basin sediment samples and stormwater samples will be collected from representative sampling points in areas of industrial activity and from the ICM water treatment system discharge. As described in Section 2.4, the main areas of product handling and storage operations are located in Drainage Area Nos. 1, 2, 3, and 4. Specific sampling objectives are as follows:

- Collect sediment samples and stormwater grab from representative catch basins in areas of industrial activity that represent unique activities and/or potential sources of COIs.
- Collect a non-stormwater grab samples from the ICM water treatment system discharge. This sample will be collected directly from sample port W-2 located on the 2-inch PVC pipe downstream of the air stripper discharge pump.

8.2 Sample Designation

what about floor drains?

Catch basins are labeled with the prefix "CB", manholes are labeled with the prefix "MH", outfalls are labeled with the prefix "O", and roof drains are labeled with the prefix "RD".

- Sediment samples will be labeled with the drainage feature (i.e., catch basin, manhole, etc.), the sampling media ("S" for sediment), and the sampling date. For example CB-3C-S-090108 will represent sediment sample collected from catch basin CB-3C on September 1, 2008.

- Stormwater samples will be labeled with the drainage feature (i.e., catch basin, manhole, etc.), the sampling media ("W" for water), and the sampling date. For example CB-3C-W-110108 will represent stormwater sample collected from catch basin CB-3C on November 1, 2008.

Why are they measuring non-SW?

- Non-stormwater samples from the ICM WTS will be labeled W-ICM-sampling data. For example W-ICM-100108 will represent an ICM WTS discharge sample collected on October 1, 2008.

8.3 Catch Basin Sediment Sampling Procedures

Catch basin sampling will consist of collecting discrete or composite grab samples from representative catch basins in Drainage Area Nos. 1, 2, 3, ~~and 4.~~ ~~Two~~ rounds of catch basin sampling will be conducted to evaluate the potential for seasonal effects and/or the effects of stormwater system maintenance. The first round of sampling will be conducted prior to the 2008/2009 rainy season and the second round of sampling will be conducted after the rainy season and analyzed for COIs to screen for potential contaminant related to operations or cleanup activities. In accordance with draft DEQ SPI guidance (DEQ 2008), the sample collection and documentation will follow the procedures documented in the City of Portland's Standard Operating Procedures Guidance for Sampling Catch Basin Solids (CH2M Hill 2003).

during? rainy season

won't get enough info out of 2 samples for this - catch basin samples can only tell you where chem might be a problem - need to follow up with in-line sed trap & whole water samples

8.3.1 Sample Locations

what not start @ outfalls (are they accessible) and if they see something, work their way back to source

Univar has not yet selected catch basin sampling locations. Univar will determine sampling locations following evaluation of the Univar maintained stormwater drainage system as described in Section 7.2. Information such as conveyance pipe alignment, catch basin type (i.e., flow through or outlet-only), adjacent operational activities, and catchment area is needed to select the best representative sampling locations. The proposed catch basin sampling locations will be described in a work plan addendum that will be submitted to EPA for approval.

8.3.2 Sample Analysis

Sediment samples will be analyzed by Columbia Analytical Services (CAS) in Kelso, Washington. The samples will be analyzed for COIs using the following methods (Table 10). It should be noted that the laboratory analysis methods selected in the SPI Work Plan are generally the same or equivalent to the methods used to analyze historical soil and water samples.

check against LWG QAPP

- Total organic carbon (TOC) by Plumb 1981 Method;
- Percent solids and grainsize by Puget Sound Estuary Program (PSEP) 1986 Method;
- Total metals by EPA Method 6020 and EPA Method 7471. The specific metals analyzed include the Al, Sb, As, Cd, Cr, Cu, Pb, Mn, Hg, Ni, Se, Ag, and Zn;
- PCB Aroclors by EPA Method 8082;

- Organochlorine Pesticides by EPA Method 8081A;
- VOCs by EPA Method 8260b;
- SVOCs by EPA Method 8270C;
- TPH – diesel and residual range organics by Ecology Method NWTPH-Dx.

If water is present in the catch basin at the time of sampling, field measurements of water quality characteristics will be taken at all sampling locations including conductivity, pH, temperature, and turbidity. Procedures for the field measurements are specified in Section 8.4.6.

8.3.3 Field Records

A description of the sampling information will be recorded on a catch basin sampling form. Sampling information recorded on the form will include the following:

- Date and time of sampling
- Sampling location
- Sample collection technique.
- Name of sampler.
- Parameters to be analyzed.
- Field parameter measurements (if water is present in catch basin): conductivity, pH, temperature, and turbidity.
- Record weather conditions at the time of sampling.
- Note the presence of water, visible flows, signs of flooding, clogging, debris in or around the catch basin, blocked inlets/outlets, staining, etc.
- Record dimensions of catch basin. Diagram inlet/outlet pipes in the catch basin. The source of inlet flows and destination of outlet flows should be noted, if known.
- Measure the depth of solids in the catch basin and the total depth of the catch basin or sump. Use a decontaminated metal rod or disposable wooden dowel to probe the total depth of the catch basin.
- When recovering samples, record visual observations of:
    - Color
    - Texture, estimates of particle size fractions (as soil classification)

- Amount and type of debris (Note: any large debris observed in the sample, including sticks, leaves, beverage containers, miscellaneous pieces of plastic and metal, stones and gravel, etc., should be removed, but paint chips and small organic matter should be left in the sample)

- Prepare a diagram of sampling locations within the catch basin, noting any special features such as sumps, inlets and outlets, etc.

- Visual observations: sheen, odor, color, floatables

- Unusual circumstances.

8.3.4 Sediment Sampling Procedures

Sediment samples will be collected using hand collection techniques described in the City of Portland Standard Operating Procedures Guidance for Sampling Catch Basin Solids (CH2M Hill 2003). This guidance lists field procedures, equipment, and materials necessary to facilitate collection of high quality catch basin sediment samples. A copy of the guidance is included in Appendix B.

Following sample collection, the samples will be stored, shipped, and documented as described in Section 8.6.

8.3.5 Sediment Sampling Procedure Alterations

Any deviations from the general sampling procedures presented here will be documented and brought to the attention of the PES project manager.

8.4 Stormwater Sampling

these will not be representative and will be of a waste of time & since it will tell nothing

Stormwater sampling will consist of collecting discrete or composite grab samples from representative sampling points in Drainage Area Nos. 1, 2, 3, and 4. This section includes the rationale for the selected sampling locations, the type and frequency of sampling, the analyses to be performed, and the sample designations. In accordance with draft DEQ SPI guidance (DEQ 2008), the sample collection and documentation will follow the procedures documented the Washington State Department of Ecology guidance for stormwater sampling (Ecology 2005). A copy of the guidance is included in Appendix C.

8.4.1 Stormwater Discharge

As discussed in Section 2.4, Drainage Area Nos. 1 through 4 are in areas of industrial activities, and Drainage Area Nos. 5 and 6 are in areas of limited or no industrial activity. Stormwater samples will be only collected from representative locations in areas of industrial activity. Drainage areas and sampling locations are shown on Figure 3 and described in Table 1.

8.4.2 Industrial Area Stormwater Sampling Locations

Whole water stormwater samples will be collected from one location in each drainage basin as shown on Figure 3. Whole water samples will be analyzed for the COIs.

It seems that these drainage areas are defined by industrial activity rather than by the physical drainage area. When they remap this system they should show physical drainage areas & delineate industrial activities within the drainage basin.

Drainage Area No. 1.

Flow through stormwater manhole designated as Sampling Point No. 1 in the SWPCP (PES 2008d).

- Rationale: All stormwater generated in Drainage Area No. 1 flows through this manhole, and therefore this location is representative of all stormwater generated within the drainage basin.

Figure 3 shows CB-4F & CB-4E connected to this line; drainage basin is not rep @ sample pt #1 & drainage area #1 should be expanded to incorporate these CBs.

Drainage Area No. 2.

Catch basin No. CB-2B designated as Sampling Point No. 2 in the SWPCP.

- Rationale: There are only two catch basins located in this drainage basin (CB-2A and CB-2B) and both are located in the eastern driveway. Each location is equally representative of industrial activities in this area because there is no substantive difference between Univar's operations near either location (i.e., loading of products packaged in consumer sized end-user containers). Catch basin No. CB-2B was replaced in 2007 as part of eastern driveway repaving activities. Catch basin No. CB-2A will be replaced in the summer of 2008 during additional repaving in the eastern driveway. Catch basin No. CB-2B is selected for consistency with historical stormwater sampling.

will get PAH hits.

Drainage Area No. 3.

SPCC stormwater manhole designated as Sampling Point No. 3 in the SWPCP.

- Rationale: All stormwater generated in Drainage Area No. 3 flows through this manhole, and therefore this location is representative of all stormwater generated within the drainage basin.

Drainage Area No. 4.

Catch basin No. CB-4F.

- Rationale: This area of the property is generally used as a drive path for trucks traveling through the operating area and reserved for overnight truck parking, trailer parking, and storage of clean containers and materials. There are a total of six catch basins in Drainage Area No. 4. One catch basin (CB-4D) is reserved for non-stormwater discharge from the ICM water treatment system and therefore is not representative of industrial activities in this area. Since trucks, trailers, empty containers, and materials are frequently moved, there is does not appear to be a substantive difference between

Univar's operations throughout the area. Therefore, any of the remaining five catch basins should yield a representative sample, and catch basin No. CB-4F is selected.

8.4.3 Sample Types and Frequency

The SPI will include sampling of four (4) storm events during the 2008/2009 water year. In accordance with draft DEQ SPI guidance (DEQ 2008), the storm events should meet storm event criteria if possible (i.e., antecedent conditions of <0.1" in 24 hr, predicted storm event total >0.2", expected storm duration of 3 hr or more). Typically the first two events are first flush, and the remaining two events are collected with in the first three hours of storm water discharge. A single grab sample will be collected from each of the four sampling points.

The first sample events will be targeted for the beginning of the rainy season in late October to mid November. The next three sampling events will be targeted for December, January, and February. Additional sampling events may be conducted if the storm event criteria are not met and there is sufficient evidence that the storm event was not a representative run-off event.

8.4.4 Sample Analysis

Stormwater samples will be analyzed by Columbia Analytical Services (CAS) in Kelso, Washington.

- Total organic carbon (TOC) by EPA Method 415.1
- Total suspended solids (TSS) bye EPA Method 160.2;
- Total metals by EPA Methods 200.8 and 1631M. The specific metals analyzed include the Al, Sb, As, Cd, Cr, Cu, Pb, Mn, Hg, Ni, Se, Ag, and Zn;
- PCB Aroclors by EPA Method 8082;
- Organochlorine Pesticides by EPA Method 8081A;
- VOCs by EPA Method 8260b;
- SVOCs by EPA Method 8270C with PAHs by EPA Method 8270C select ion monitoring (SIM);
- Cyanide by Standard Method (SM) 4500-CN-E;
- Oil and grease (hexane extractable materials [HEM]) by EPA Method 1664; and
- TPH – diesel and residual range organics by Ecology Method NWTPH-Dx.

check

Field measurements of water quality characteristics will be taken at all sampling locations including conductivity, pH, temperature, and turbidity. Procedures for the field measurements are specified in Section 8.4.6.

8.4.5 Field Records

A description of the sampling information will be recorded on a stormwater sampling form. Sampling information recorded on the form will include the following:

- Estimated time of start of rainfall event
- Date and time of sampling
- Sampling location
- Sample collection technique
- Name of sampler
- Parameters to be analyzed
- Field parameter measurements: conductivity, pH, turbidity, and temperature.
- Qualitative estimate of flow through sampled catch basin: high, medium, low
- Record weather conditions at the time of sampling and visual observations of stormwater flow: sheen, odor, color, floatables
- Unusual circumstances

8.4.6 Stormwater Sampling Procedures

this is a waste of time

Stormwater samples will be collected using hand collection techniques. Table 12 presents a list of equipment to be used for all of the sampling activities. A summary of the surface water sampling procedures is listed below:

1. The catch basin grate cover or manhole cover will be removed and a single grab sample will be collected from the sump or discharge pipe (whichever is accessible).
2. The sample container labels will be filled out and attached to the appropriate jars.
3. Each bottle to be filled will be attached to a sampling pole, dipped into the flowing water in the catch basin (facing upstream), and filled with the stormwater flowing through the catch basin. The sample container will be filled to near the top taking care not to overfill the bottles and dilute the sample preservative.

Note that in the case of VOC samples, stormwater will be collected in a clean glass container and then transferred to preserved sample vials so that the vial can be completely filled without overfilling and possibly diluting the sample preservative.

4. In a similar fashion, a clean container will be filled for temporary use in field measurements of conductivity, pH, temperature, and turbidity. The sample will be transferred to a plastic sample cup for pH measurement with a pH meter or pH paper and to a glass sample vial for turbidity measurements. Upon completion of the field measurements, the sample water will be discarded back into the storm drain.

5. The stormwater sampling field form will be completed and visual observations recorded. Record visual observations at the sampling location quarterly, at all other discharges once a year, and yearly during the dry season (after 7 consecutive days of no rain).

6. Upon completion of the sampling, the sample bottles will be placed directly into a cooler filled with ice.

7. Following sample collection, the samples will be stored, shipped, and documented as described in Section 8.6.

8.4.7 Stormwater Sampling Procedure Alterations

Any deviations from the general sampling procedures presented here will be documented and brought to the attention of the PES project manager.

8.4.8 Storm Event Documentation

In accordance with the draft DEQ SPI guidance (DEQ 2008) a rainfall distribution graph will be prepared that begins 24 hours prior to the storm event with an indication of when the sampling took place. Rainfall data will be gathered from the nearest City of Portland rain gage: Yeon rain gage located at 3395 NW Yeon Avenue. The City of Portland rain gages measure hourly rainfall data. Data from the rain gage is available on the following website: http://or.water.usgs.gov/non-usgs/bes/.

8.5 Non-Stormwater Sampling

Non-stormwater samples will be collected from the ICM water treatment system discharge and potentially from groundwater infiltrating the storm sewer (if applicable).

8.5.1 ICM Water Treatment System Sampling

One non-stormwater grab sample will be collected from ICM water treatment system discharge since the water quality at this sampling point does not vary significantly over time. This sample will be collected directly from sample port W-2 located on the 2-inch PVC pipe downstream of the air stripper discharge pump.

Non-stormwater samples will be analyzed by Columbia Analytical Services (CAS) in Kelso, Washington for the same suite of parameters as stormwater samples (see Section 8.4.4) unless Univar has previously eliminated individual COIs based on catch basin sediment and stormwater sample results. The samples will be collected concurrent with monthly WTS discharge sampling that is required by the NPDES Permit No. 101613.

Upon completion of the sampling, the sample bottles will be placed directly into a cooler filled with ice. Following sample collection, the samples will be stored, shipped, and documented as described in Section 8.6. Any deviations from the general sampling procedures presented here will be documented and brought to the attention of the PES project manager.

8.5.2 Potential Groundwater Infiltration Sampling

As described in Section 7.3, there is no reason to assume at this time that groundwater is infiltrating the stormwater drainage system and thus Univar has not prepared a focused sampling and analytical plan for groundwater infiltration sampling. If groundwater infiltration is observed, Univar will submit a supplemental work plan to EPA prior to collecting samples of groundwater infiltrating the stormwater drainage system.

8.6 Sample Labeling, Shipping, and Chain-of-Custody

All environmental samples collected during the project will be labeled, stored and shipped using the protocols summarized below.

8.6.1 Sample Labeling

Sample container labels will be completed immediately before or immediately following sample collection. Container labels will include the following information:

- Project name
- Sample number
- Initials of collector
- Date and time of collection
- Analysis requested

8.6.2 Sample Transportation

Stormwater samples will be transported to the designated laboratory using the following procedures:

- Sample containers will be transported in a cooler or other suitable shipping container;
- Ice or "blue ice" will be placed into each shipping container with the samples;
- All sample shipments will be accompanied by a chain-of-custody form. The completed form will be sealed in a plastic bag; and
- The name and address of the analytical laboratory will be placed on each shipping container prior to transportation.

8.6.3 Chain-Of-Custody

Once a sample is collected, it will remain in the custody of the sampler or other environmental contractor personnel until shipment to the laboratory. Upon transfer of sample possession to subsequent custodians, a chain-of-custody form will be signed by the persons transferring custody of the sample container. Upon receipt of samples at the laboratory, the receiver will record the condition of the samples. Chain-of-custody records will be included in the analytical report prepared by the laboratory.

8.6.4 Sample Log-in

Upon receipt of samples (which will be accompanied by a completed chain-of-custody record detailing requested analyses), the laboratory coordinator(s) or his/her delegate will:

- Verify all paperwork, chain-of-custody records, and similar documentation;
- Log-in samples, assign unique laboratory sample numbers, and attach the numbers to the sample container(s);
- Open project file and enter data into the file;
- Store samples in a refrigerated sample bank; and
- Fax a record of the sample receipt and log-in form to the PES project manager noting any problems with the samples.

8.7 Decontamination and Residuals Management

A sample collection pole will be used to lower and hold the sample bottles to the sample collection point. The sample collection pole will not come into contact at any time with the interior of the sample bottle. At the completion of a sampling event, the sample collection pole will be wiped down with a moist towel and allowed to air dry.

Disposable sampling gloves will be used during sampling activities and will be disposed of in the garbage after use. It is not anticipated that any other residuals will be generated during sampling activities.

For locations where phthalates will be sampled the procedures followed will be identical to those noted above with the following exceptions. During all decontamination procedures equipment will be handled with powder and phthalate-free vinyl gloves and will not be placed on any plastic or rubber surfaces (decontaminated stainless steel surfaces are preferred). Sample bottles will not be placed on any plastic or rubber surfaces during sample processing (decontaminated stainless steel surfaces are preferred) Once the sample bottles are filled after sample processing, they will be capped with Teflon® lids and placed in phthalate free containers before placing in coolers for transport.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

Sample quality assurance (QA) and quality control (QC) measures are undertaken to ensure that the data collected during the project are acceptable for their intended use(s).

9.1 Quality Assurance Objectives

The overall quality assurance (QA) objective for measurement data is to ensure providing data of known and acceptable quality. All measurements will be made to yield accurate and precise results representative of the media and conditions measured. Chemical analyses will be performed in accordance with the requirements of the analytical methods. All sample results will be calculated and reported in consistent units to allow comparison of the sample data with regulatory criteria and federal, state, and local databases. QA objectives for precision, accuracy, and completeness have been established for each measurement variable. The laboratory quality control (QC) program is consistent with the previously approved SAP/QAPP QC program (ITC 2001). The work elements relative to the approved SAP/QAPP are listed in Table 13. The type of QC samples and the frequency of collection or analysis are discussed below and in Table 14. The control limits and are presented in Table 15. Reporting limits (RLs) are specified in Table 11, and laboratory deliverables are presented in Table 16.

The following work elements to support the planned activities are subject to the quality assurance project plan (QAPP):

- Catch basin sediment sample collection for laboratory analysis;

- Stormwater whole water sample collection for laboratory analysis;
- Non-stormwater sample collection for laboratory analysis; and
- Laboratory analysis of sediment and water samples by the methods listed in Section 8.0.

9.2 Chemical Analyses

9.2.1 Conventional Analyses

Conventional analyses of sediment samples will include total organic carbon (TOC), percent solids, and grain size distribution. Conventional analyses of stormwater samples will include TOC and total suspended solids (TSS). EPA and Puget Sound Estuary Program (PSEP) methods will be used as shown in Table 10

TOC in sediment samples will be analyzed according to Plumb (1981). TOC in stormwater samples will be analyzed according to EPA Method 415.1 (EPA 2006).

Percent solids in sediment samples will be determined according to PSEP (1986). These results will be used to calculate analyte concentrations on a dry-weight basis. Grain size analysis will also be completed using PSEP (1986) protocols. Organic material in the samples will not be oxidized prior to analysis. Sieve sizes 4, 10, 18, 35, 60, 120, and 230 will be used to determine gravel and sand fractions, and phi size intervals 4-5, 5-6, 6-7, 7-8, 8-9, 9-10, and >10 will be determined for the silt and clay fractions using the pipette method.

TSS in stormwater samples will be analyzed according to EPA Method 160.2.

9.2.2 Laboratory Analyses

List the specific lab methods and reference Table 10.

- Metals in sediment samples will be analyzed according to EPA 6000/7000 series methods. The specific metals analyzed include Al, Sb, As, Cd, Cr, Cu, Pb, Mn, Hg, Ni, Se, Ag, and Zn. EPA Method 200.8 will be used to analyze Al, Sb, As, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, and Zn. Mercury will be analyzed using EPA Method 1631M.
- PCB Aroclors in sediment and stormwater samples will be analyzed according to EPA Method 8082 with low level reporting limits.
- VOCs in sediment and stormwater samples will be analyzed according to EPA Method 8260b.
- Chlorinated herbicides will be analyzed according to EPA Method 8151A.

- Organochlorine pesticides in sediment and stormwater samples will be analyzed according to EPA Method 8081. Both the standard and NOAA analyte lists will be reported.

- SVOCs in sediment and stormwater samples will be analyzed by EPA Method 8270C. PAH analytes in water samples will be analyzed by EPA Method 8270C select ion monitoring (SIM) to achieve low level reporting limits.

- TPH in sediment and stormwater samples will be analyzed for diesel and oil range organics by Ecology Method NWTPH-Dx.

- Oil and Grease in stormwater samples will be analyzed by EPA Method 1664 for hexane extractable materials (HEM). Sediment samples will not be analyzed for oil and grease.

9.2.3 Field Parameters

Field measurements of water quality characteristics will be taken at all sampling locations including conductivity, pH, temperature, and turbidity.

9.3 <u>Data Reduction, Validation, and Reporting</u>

The laboratory performing sample analyses will be required to submit summary data and QA information to permit independent and conclusive determination of data quality. The determination of data quality will be performed using EPA as guidelines for data review (EPA 1999, 2004). Section 9.4 describes the procedures that will be used to evaluate the precision, accuracy, and completeness of the analytical test data. Upon completion of the data review, the QA reviewer will be responsible for developing a data validation memorandum for the lab data.

9.3.1 Laboratory Reporting

Consistent with the previously approved SAP/QAPP (ITC 2001), the laboratory performing sample analyses will be required to submit summary data and QA information to permit independent determination of data quality. The determination of data quality will be performed using the EPA Contract Laboratory Program National Functional Guidelines for organic and inorganic data review as guidelines for data review.

An EPA Level II or equivalent data report will be obtained from the analytical laboratory. Laboratory deliverable requirements for lab analyses are outlined below and included in Table 16. This table was duplicated from the 2001 SAP/QAPP with slight modification.

- Narrative cover letters for each sample batch will include a summary of any QC, sample, shipment, or analytical problems, and will document all internal decisions. Problems will be outlined and final solutions documented. A copy of the signed chain-of-custody form for each batch of samples will be included in the results packet;

- Sample concentrations will be reported on standard data sheets in proper units and to the appropriate number of significant figures. For undetected values, the lower limit of detection for each compound will be reported separately for each sample. Dates of sample extraction or preparation and analysis must be included;
- A method blank summary;
- Surrogate percent recovery will be calculated and reported for GC and GC/MS analyses;
- LCS results;
- MS/MSD percent recoveries, spike level, and relative percent difference will be included;
- Laboratory duplicate results; and
- Laboratory reports will be e-mailed to the PES project manager. Copies of the full data set and electronic data deliverables formatted per PES requirements will also be transmitted to the PES project manager.

9.3.2 Field Measurement Data

The project manager will check the validity of all field data on a periodic basis by reviewing calibration procedures utilized in the field and by comparing the data to previous measurements obtained at the specific site.

9.3.3 Final Reporting and Archiving of Documents

Copies of all analytical data and/or final reports will be retained in the laboratory files. After one year, or whenever the data becomes inactive, the files will be transferred to archives in accordance with standard laboratory procedure. Data may be retrieved from archives upon request.

9.4 Data Assessment Procedures

Accuracy, precision, completeness, representativeness, and comparability are terms used to describe the quality of analytical data. Routine procedures for measuring precision and accuracy include use of replicate analyses, standard reference materials (SRMs), matrix spikes, and procedural blanks. Replicate matrix spikes and method blanks will be analyzed by the selected laboratory for the analytical batch. Additional spikes and replicate analyses may be implemented. The minimum frequencies are as follows:

- Matrix Spike
  - One matrix spike and laboratory control sample or one matrix spike/matrix spike duplicate will be analyzed per sample batch (no more than 20 samples per batch)

- Method Blank
  - One preparation blank will be analyzed per 12-hour shift.

Quality of analytical data represented by precision and accuracy are calculated using the mean, standard deviation, and percent recoveries. The mean, C, of a series of replicate measurements of concentration, C_i, for a given analyte will be calculated as:

$$\overline{C} = \frac{1}{n}\sum_{i=1}^{n} C_i$$

where:

n = Number of replicate measurements

The estimate of precision of a series of replicate measurements can be expressed as the relative standard deviation, RSD:

$$\mathrm{RSD} = \frac{SD}{\overline{C}}\ X\ 100\%$$

where:

SD = Standard deviation:

$$SD = \frac{\sqrt{\sum_{i=1}^{n}(Ci-\overline{C})^2}}{(n-1)}$$

Alternatively, for data sets with a small number of points (e.g., duplicate measurements), the estimate of precision will be expressed as a relative percent difference (RPD):

$$RPD = \frac{C_1 - C_2}{\overline{C}}\ x\ 100$$

where:

C_1 = First concentration value or recovery value measured for a variable

C_2 = Second concentration value or recovery value measured for a variable

Accuracy as measured by matrix spike or laboratory control sample results will be calculated as:

$$\text{Recovery} = \frac{\Delta C}{C_s} \, x \, 100$$

where:

ΔC = The measured concentration increase due to spiking (relative to the unspiked portion)

C_s = The known concentration increase in the spike

Acceptable spike recoveries and acceptable relative percent differences (RPDs) are indicated in the appropriate analytical methodology or provided by the laboratory(s) based on control-charted recoveries.

Accuracy can also be measured by analysis of standard reference material (SRM) or regional reference material and will be determined by comparing the measured value with the 95 percent confidence interval established for each analyte.

Completeness will be measured for each set of data received by dividing the number of valid measurements actually obtained by the number of valid measurements that were planned.

9.5 Field Quality Assurance

Field QA will be maintained through compliance with the SAP and documentation of sampling plan alterations. If problems arise during field sampling, a Sampling Alteration Checklist will be completed.

9.6 Corrective Action

Nonconforming items and activities are those, which do not meet the project requirements or approved work procedures. Non-conformances may be detected and identified by project staff or laboratory staff. The person identifying the nonconformance will be responsible for reporting it to the PES project manager and for its documentation.

- Project Staff. During the performance of field activities and testing and verification of laboratory testing results;
- Laboratory Staff. During the preparation for and performance of laboratory testing, calibration of equipment, and QC activities; and
- QA Staff. During the performance of audits.

Documentation will be made available to the PES project manager. Appropriate personnel will be notified by the management of any significant nonconformance detected by the project or laboratory staff. Completion of corrective actions for significant nonconformance will be verified by the PES project manager.

9.7 Files and Document Control

All records and files associated with the project will be maintained by PES in project files. Files will be maintained using standard PES file numbering protocols. Electronic files are stored on computer hard drives and backed up to compact disks on a routine schedule.

9.7.1 Record Control

Following receipt of information from external sources, completion of the field and laboratory phases of the project, and completion of analyses and issuance of reports or other transmittals, associated records will be submitted to the central project files. Field records; laboratory data summaries; test data; numerical calculations; reports and other data transmittals; copies of purchase orders for project services and contracts; correspondence including incoming and outgoing letters, memorandums, and telephone records; photographs; reference material; drawings; and CDs containing computer data and information will be transferred to the project central file. Records submitted to the project central file will be placed in folders or otherwise secured for filing.

9.7.2 Laboratory Files

The laboratory will maintain a records management system for documents pertinent to analytical performance. Laboratory records will include documents which are specific to the project, such as chain of custody, raw analytical data, and analytical reports, and documents which demonstrate overall laboratory operation, such as instrument log books and control charts.

9.7.3 Record Retention

Records will be stored for one year in hard copy and five years as magnetic tape (where applicable). For the project central file, the individual file folders will be divided into appropriate categories based on content, and numbered and filed sequentially within each category. For the original drawing and QA files, material will be filed only by project number. Computer files of laboratory data and other project information will be filed by project number and date.

10.0 REPORTING

The results of the investigation will be submitted in a report according to CMI Implementation Schedule included in the Final CMI Work Plan (PES 2008a). The report will include a summary description of field activities and results, rainfall distribution graphs, data summary tables, data validation reports, and electronic copies of laboratory reports.

11.0 LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

12.0 REFERENCES

Bridgewater Group, Inc. (BRI). 2004. *Soil and Groundwater Remedial Investigation, Container Recovery Site, 3900 NW Yeon Avenue, Portland, Oregon.* Prepared for Michael Malone Properties. September 17.

Bureau of Environmental Services (BES), City of Portland. 2006a. Industrial Wastewater Discharge Permit No. 400.025. March 7.

Bureau of Environmental Services (BES), City of Portland. 2006b. Letter to EPA *"City of Portland Bureau of Environmental Services Comments on EPA Proposed Final RCRA Corrective Measures Remedy"*. September 22.

Bureau of Environmental Services (BES), City of Portland. 2008. Letter to Univar *"Annual Stormwater Facility Inspection"*. March 7.

CH2M Hill. 2003. *Standard Operating Procedures, Guidance for Sampling Catch Basin Solids.* Prepared for the City of Portland. July.

Harding Lawson Associates (HLA). 1989. *Data Collection Quality Assurance Plan.* Prepared for VW&R. February 14.

Harding Lawson Associates. 1993. *RCRA Facility Investigation Report, Van Waters & Rogers Inc., 3950 NW Yeon Avenue, Portland, Oregon.* Prepared for Van Waters & Rogers Inc.

Harding Lawson Associates (HLA). 1996. *Field Report for Storm Sewer Inspection, Van Waters & Rogers, Inc., Portland, Oregon.* September 17.

IT Corporation (ITC). 2001. *Sampling and Analysis Plan and Quality Assurance Project Plan, Deep Aquifer Investigation, Vopak USA Inc. Portland, Oregon, Facility.* Prepared for Vopak USA Inc. July 5.

Oregon Department of Environmental Quality (DEQ). 2008. *Guidance for Evaluating the Stormwater Pathway at Cleanup Sites, Public Review Draft.* May 1.

Oregon Department of Environmental Quality (DEQ). 2004. *National Pollutant Discharge Elimination System Waste Discharge Permit No. 101613.* Expiration date March 31, 2009.

PES Environmental, Inc. (PES). 2006. *Final Corrective Measures Study Report, Univar USA Inc., Portland, Oregon, Volume 1.* Prepared for Univar USA Inc. May 22.

PES Environmental, Inc. (PES). 2007. *Progress Report 2007-4: October through December 2007, Univar USA Inc., Portland, Oregon.* Prepared for Univar USA Inc. February 4.

PES Environmental, Inc. (PES). 2008a. *Final Corrective Measures Implementation Work Plan, Univar USA Inc., Portland, Oregon.* Prepared for Univar USA Inc. February 8.

PES Environmental, Inc. (PES). 2008b. *Corrective Measures Implementation, Final Design Investigation Work Plan, Univar USA Inc., Portland, Oregon.* Prepared for Univar USA Inc. March 27.

PES Environmental, Inc. (PES). 2008c. *Progress Report 2008-1: January through March 2008, Univar USA Inc., Portland, Oregon.* Prepared for Univar USA Inc. April 30.

PES Environmental, Inc. (PES). 2008d. *Stormwater Pollution Control Plan, Portland, Oregon, Revision No. 2.* Prepared for Univar USA Inc. May.

Univar USA, Inc. (Univar). 2005. *Emergency Contingency Plan, Univar USA Inc., 3950 NW Yeon Avenue, Portland, OR, 97210.* Updated March.

Univar USA, Inc. (Univar). 2006. *Accidental Spill Prevention Plan, Univar USA, Inc., 3950 NW Yeon Avenue, Portland, OR, 97210-1412.* Updated April 3.

U.S. Environmental Protection Agency (EPA). 1988. *Administrative Order on Consent to Perform a RCRA Facility Investigation and Corrective Measures Study, RCRA Docket No. 1087-10-18-3008.* June 15.

U.S. Environmental Protection Agency (EPA). 1999. *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review.* USEPA Office of Emergency and Remedial Response.

U.S. Environmental Protection Agency (EPA). 2004. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.* USEPA Office of Superfund Remediation and Technology Innovation.

U.S. Environmental Protection Agency and Oregon Department of Environmental Quality (EPA/DEQ). 2005. *Portland Harbor Joint Source Control Strategy, Final.* December 2005.

U.S. Environmental Protection Agency (EPA). 2006. *Statement of Basis, Proposed RCRA Remedy Selection, Univar USA Inc., Portland, Oregon.* August 17.

U.S. Environmental Protection Agency (EPA). 2007. *Amendment to the Administrative Order on Consent RCRA Docket No. 1087-10-18-3008 for the Corrective Measures Implementation at the Univar USA Inc., Portland, Oregon Facility, EPA ID No. ORD009227398.* August 1.

Van Waters & Rogers Inc. VWR). 1996. *Progress Report 50, Van Waters & Rogers Inc., 3950 NW Yeon Avenue, Portland, Oregon, ORD 009227398.* November 10.

Washington State Department of Ecology (Ecology). 2005. *How To Do Stormwater Sampling, A Guide for Industrial Facilities.* Publication No. 02-10-071. Revised January.

TABLES

Table 1

Bulk Tank List and March 2008 Inventory
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

TANK	Size (gals)	PRODUCT	TANK	Size (gals)	PRODUCT
TS1-01	28,946	Acetone	**TS1-44**	5,949	Empty
TS1-02	28,946	Mineral Spirits Low Arom	**TC1-51**	3,181	Texanol
TS1-03	28,946	Acetone	**TC1-52**	3,181	Texanol
TS1-04	28,946	Toluene	**TC1-53**	3,181	Texanol
TS1-05	12,310	Arcosolv PM	**TC1-54**	8,000	Blend Tank
TS1-06	12,310	Vanzol A-1 190	**TC1-55**	5,949	Glycol Ether EB
TS1-07	12,310	Heptane	**TC1-56**	5,949	Lipotin 100
TS1-08	12,310	Ethylene Glycol	**TC1-59**	12,000	Vesenex 80
TS1-09	12,310	DEG (MM/XL WHSE)	**TC1-60**	7,677	Aqua Ammonia
TS1-10	12,310	Woodlife 111	**TC1-61**	6,074	Nitric Acid
TS1-11	25,770	Ethylene Glycol	**TC1-62**	6,074	Nitric Acid
TS1-12	21,860	Woodlife 111	**TC1-63**	10,528	Sulfuric Acid
TS1-13	20,571	DEG (MM/XL WHSE)	**TC1-65**	6,000	Water
TS1-13		DEG (Portland WHSE)	**TC1-66**	6,000	Aluminium Sulfate
TS1-14	21,860	Xylene	**TC1-67**	6,000	Propylene Gylcol
TS1-15	38,600	Solvent 2322	**TC1-68**	12,831	Caustic Potash 45%
TS1-16	38,600	Woodtreat MB RTU	**TC1-69**	12,831	Caustic Potash 45%
TS1-17	10,575	Xylene	**TC1-70**	12,000	Caustic 25%
TS1-18	10,575	Empty	**TC1-71**	10,000	Water
TS1-19	10,575	Empty	**TC1-75**	4,000	Neutralization Water
TS1-20	10,575	VM&P Naptha	**TC1-76**	14,805	Versenex 80
TS1-21	10,575	Isopropyl Alcohol 85%	**TC1-77**	14,805	Versenes 100
TS1-22	10,575	Empty	**TC1-80**	8,000	Corrosive Blend Tank
TS1-23	38,600	Triethylamine	**TC1-81**	1,100	Corrosive Blend Tank/Dry
TS1-24	38,600	Empty	**TC1-82**	7,520	Caustic Soda 50%
TS1-25	38,600	Methanol	**TC1-83**	8,200	Hydrochloric Acid
TS1-26	38,600	Methanol	**TC1-92**	10,000	Sodium Bisulfite 38%

Note:

a) Bulk tank contents listed are based on the inventory in March 2008. Depending on current customer demands, the amount of the listed product in a tank may vary (i.e., the tank may be only partially full) or the product stored in a given tank may have changed. Univar maintains a current inventory of the tank contents at the facility.

Table 3

Drainage Basin List
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Drainage Area Number	Estimated Impervious Area (sq. ft.)	Description	Stormflow Connections to Storm Sewer	Stormwater Sampling Points[a,b]
1	64,100	Southern half of rail spur, drum fill area, and solvent tank farm area	Lateral from basin is directly connected to 42" main onsite.	SP-1: flow through storm manhole
2	107,300	Eastern portion of the site including east drive, covered storage structures, and the eastern half of the warehouse	1) 2 catch basins are directly connected to 42" main onsite. 2) 2 roof drains are directly connected to 42" main onsite.	SP-2: Catch basin CB-2B
3	65,900	Central portion of the site including corrosive tank farm and central rail spur	Lateral from basin is directly connected to 42" main onsite.	SP-3: flow through SPCC manhole
4	105,200	Southern portion of site including remediation building	1) 2 catch basins connected to pipe from Drainage Basin No. 1 2) 3 catch basins are directly connected to 42" main onsite. 3) 1 roof drain is directly connected to 42" main onsite. 4) Non-stormwater catch basin from remediation system is directly connected to 42" main onsite.	Stormwater: Catch basin CB-4F Non-Stormwater: Catch basin CB-4D
5	35,300	North-western portion of site including rail spur, truck unloading, and employee parking.	Lateral from basin is directly connected to 8" main on American Steel property.	None
6	39,800	Northern portion of the site mainly used for employee parking.	Lateral from basin is directly connected to 42" main onsite.	None

Note:

a) The stormwater sampling points in Drainage Basin Nos. 1, 2, and 3 are consistent with the SWPCP (PES 2008d).

b) There are two sampling points in Drainage Basin No. 4. One is a stormwater sampling point (CB-4F), and the other is a non-stormwater sampling point for treated groundwater. The ICM groundwater treatment system discharges treated groundwater via catch basin CB-4D directly to the 42-inch stormwater main via NPDES Permit No. 101613.

Historical Soil and Groundwater Sampling Data
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Parameter	Highest Soil Concentration[a] (ug/kg)	Soil SLV[d] (ug/kg)	Groundwater Concentration Highest[b] (ug/L)	Groundwater Concentration Adjacent[c] (ug/L)	Groundwater SLV[d] (ug/L)
Benzene	840	**NA**	840	20	**51**
Bromoform	ND	**NA**	ND	< 0.5	**140**
Chloroform	ND	**NA**	7	< 0.5	**470**
1,1-Dichloroethane	18,000	**NA**	6,100	10	**47**
1,2-Dichloroethane	14,000	**NA**	1.2	1.2	**37**
1,1-Dichloroethene	13,000	**NA**	2,200	< 0.5	**NA**
cis-1,2-Dichloroethene	82,000	**NA**	53,000	19	**NA**
trans-1,2-Dichloroethene	8,600	**NA**	55	< 0.5	**1000**
Ethylbenzene	1,100,000	**NA**	8,900	< 0.5	**7.3**
Styrene	470,000	**NA**	1,300	< 0.5	**NA**
Tetrachloroethene	14,000,000	**500**	39,000	3.1	**3.3**
Toluene	21,000,000	**NA**	120,000	1.2	**9.8**
1,1,1-Trichloroethane	16,000,000	**NA**	7,600	< 0.5	**11**
1,1,2-Trichloroethane	ND	**NA**	ND	< 0.5	**16**
Trichloroethene	1,700,000	**2,100**	23,000	4.7	**3.0**
Vinyl chloride	2,000	**NA**	1,700	20	**2.4**
m-Xylene	NM	**NA**	NM	NM	**NA**
o-Xylene	1,200,000	**NA**	8,100	< 0.5	**13**
p-Xylene	950,000	**NA**	NM	NM	**NA**
m,p-Xylenes	4,200,000	**NA**	23,000	< 0.5	**1.8**
Xylenes (total)	3,050,000	**NA**	31,100	< 1.0	**NA**
Benzo(b)fluoranthene	ND	**NA**	NM	NM	**0.018**
Indeno(1,2,3-cd)pyrene	ND	**100**	NM	NM	**0.018**
Other Chemicals Detected During Site Investigations[e]					
Dichlorodifluoromethane (CFC 12)	6,700	**NA**	< 0.5	< 0.5	**NA**
Isopropylbenzene	16,000	**NA**	12	< 2.0	**NA**
n-Propylbenzene	78,000	**NA**	9.3	2.2	**NA**
1,3,5-Trimethylbenzene	150,000	**NA**	3.0	< 2.0	**NA**
1,2,4-Trimethylbenzene	480,000	**NA**	26	< 2.0	**NA**
sec-Butylbenzene	17,000	**NA**	4.8	< 2.0	**NA**
4-Isopropyltoluene	18,000	**NA**	< 2.0	< 2.0	**NA**
n-Butylbenzene	66,000	**NA**	2.4	< 2.0	**NA**
1,2-Dichlorobenzene	ND	**1,700**	21	< 0.5	**763**
1,4-Dichlorobenzene	ND	**300**	0.58	< 0.5	**190**
Naphthalene	32,000	**561**	< 2.0	< 2.0	**620**

Table 4

Historical Soil and Groundwater Sampling Data
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Parameter	Highest Soil Concentration[a] (ug/kg)	Soil SLV[d] (ug/kg)	Groundwater Concentration Highest[b] (ug/L)	Groundwater Concentration Adjacent[c] (ug/L)	Groundwater SLV[d] (ug/L)

Notes:

a) Highest soil concentration published in the RFI (HLA 1993), CMS (PES 2006), and draft data from the April 2008 CMI Design Investigation.

b) Highest groundwater concentration from shallow groundwater monitoring wells and groundwater extraction wells reported in the 4th quarter 2007 progress report (PES 2007) and 1st quarter 2008 progress report (PES 2008c).

c) Highest reported groundwater concentration in groundwater monitoring wells adjacent to the 42-inch diameter stormwater mains along the eastern property boundary and in the NW Yeon Avenue frontage road. The wells include SMW-3, -9, -10, -11, 16, -17, -18, -21, -23, -24, and -27; PZ-3 and -9; and EXW-4A.

d) Screening level value listed in DEQ Guidance for Evaluating the Stormwater Pathway at Cleanup Sites - Appendix D, Public review draft. May 1, 2008 (DEQ 2008).

e) These chemicals were not retained as COCs in the CMS report (PES 2006), but were detected during site remedial investigations.

SLV = Screening Level Value
ug/L = micrograms per liter
ug/kg = micrograms per kilogram
ND = Not Detected - various MRLs
NM = Not Measured
NA = Not Applicable
MRL = Method Reporting Limit

Table 5

Groundwater Treatment System Discharge Data
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Parameter	Discharge Permit Limits[a] Daily Maximum (ug/L)	Discharge Permit Limits[a] Average Monthly Maximum (ug/L)	Groundwater SLV[c] (ug/L)	Laboratory MRL[b] (ug/L)	Historical Detections: Total Number of Detections[d]	Historical Detections: Range of Detections (ug/L)
Benzene	8	5	51	5	0	NA
Chloroethane	8	5	NA	5	0	NA
1,2-Dichloroethane	8	5	37	5	0	NA
cis-1,2-Dichloroethene	40[e]	25[e]	NA	5	6	7.6 - 40
trans-1,2-Dichloroethene	40[e]	25[e]	1,000	5	0	NA
Tetrachloroethene	48	30	3.3	5	2	5.9 - 71
1,1,1-Trichloroethane	21	13	11	5	2	5.3 - 42
1,1,2-Trichloroethane	8	5	16	5	0	NA
Trichloroethene	125	78	3.0	5	4	5 - 100
Vinyl chloride	18	11	2.4	5	0	NA
Cyanide	65	50	5.2	10	6	8 - 20
Oil and Grease	15,000	10,000	NA	5,000	2	2,300 - 5,600
pH	6.5 - 8.5	6.5 - 8.5	NA	NA	0	NA
Other Chemicals Detected in Water Treatment System Discharge[f]						
2-butanone (MEK)	NA	NA	NA	5	1	31
Ethylbenzene	NA	NA	7	5	2	5.7 - 11
Toluene	NA	NA	9.8	5	4	15 - 120
m,p-Xylenes	NA	NA	1.8	5	3	6.4 - 30
o-Xylene	NA	NA	13	5	1	7.3

Notes:

a) Discharge limits per NPDES Waste Discharge Permit No. 101613, expires March 31, 2009 (DEQ 2004).

b) Laboratory method reporting limit (MRL) for VOCs is EPA Method 624.
in the 4th quarter 2007 progress report (PES 2007) and 1st quarter 2008 progress report (PES 2008c).

c) Screening level value listed in DEQ Guidance for Evaluating the Stormwater Pathway at Cleanup Sites - Appendix D, Public review draft. May 1, 2008 (DEQ 2008).

d) Number of detections of parameter in monthly compliance monitoring samples since water treatment system startup in 2001.

e) Discharge permit levels are listed for the sum of cis- and trans- isomers of 1,2-dischloroethene.

f) These parameters do not have discharge permit levels, but have been detected in water treatment system discharge at least one time since water treatment system startup in 2001.

SLV = Screening Level Value
MRL = Method Reporting Limit
ug/L = micrograms per liter

Table 6

Historical Stormwater Sampling Data
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Parameter	Units	Stormwater Benchmark[a] (ug/L)	Stormwater SLV[b] (ug/L)	Laboratory MRL (ug/L)	Historical Data[c] Summary of Detected Concentrations Minimum (ug/L)	Maximum (ug/L)	Average (ug/L)	Total Number of Detections	Total Number of Samples
Copper	ug/L	100	2.7	10	4.53	108	27	37	49
Lead	ug/L	400	0.54	2	3.2	141	20	48	49
Zinc	ug/L	600	36	10	54.9	824	214	49	49
Oil and Grease	mg/L	10	NA	5	5.2	16	9.2	15	49
Total Suspended Solids	mg/L	130	NA	5	7	1,420	141	49	49
pH	Standard Units	5.5 - 9.0	NA	NA	4.9	9.6	7.0	49	49

Notes:

a) Discharge limits per NPDES Waste Discharge Permit No. 101613, expires March 31, 2009 (DEQ 2004).

b) Screening level value listed in DEQ Guidance for Evaluating the Stormwater Pathway at Cleanup Sites - Appendix D, Public review draft. May 1, 2008 (DEQ 2008).

c) Historical data from 49 stormwater samples collected during 17 stormwater sampling events beginning in the 1999/2000 rainy season through the 2007/2008 rainy season.

MRL = Method Reporting Limit
SLV = Screening Level Value
ug/L = Micrograms per liter
O&G = Oil and Grease
TSS = Total Suspended Solids
NA = Not Applicable
NM = Not Measured
NS = Not Sampled

Table 7

Industrial Wastewater Permit Data
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Parameter	Discharge Permit Limits[a] (ug/L)	Screening Level Value (SLV)[b] (ug/L)
Arsenic	200	**0.14**
Cadmium	700	**0.094**
Chromium	5,000	**NA**
Copper	3,700	**2.7**
Lead	700	**0.54**
Mercury	10	**0.77**
Molybdenum	1,400	**NA**
Nickel	2,800	**16**
Selenium	600	**5**
Silver	400	**0.12**
Zinc	3,700	**36**
1,2-Dichloroethane	500	**37**
Acrylonitrile	1,000	**0.25**
Chlorobenzene	200	**50**
Chloroform	200	**470**
Trichloroethene	200	**3**
Nitrobenzene	2,000	**690**
2,4-dinitrotoluene	130	**3.4**
Pentachlorophenol	40	**3**
Chlordane	30	**0.00081**
Sulfide (dissolved)	4,000	**NA**
Cyanide	1,200	**5.2**
Non-polar Oil and Grease	110,000	**NA**
pH	5.5 - 11.5	**NA**
Other Chemicals Reportedly Present in Wastewater[c]		
Acetone	NA	**1,500**
Toluene	NA	**9.8**
Sulfate	NA	**NA**
Ammonia	NA	**NA**
Di-n-butyl phthalate	NA	**3**
bis-2-ethylhexylphthalate	NA	**2.2**

Table 7

Industrial Wastewater Permit Data
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Parameter	Discharge Permit Limits[a] (ug/L)	Screening Level Value (SLV)[b] (ug/L)

Notes:

a) Discharge permit limit listed in BES Industrial Wastewater Discharge Permit No. 400.025, expires March 3, 2011 (BES 2006a)

b) Screening level value listed in DEQ Guidance for Evaluating the Stormwater Pathway at Cleanup Sites - Appendix D, Public review draft. May 1, 2008 (DEQ 2008).

c) The screening level value is calculated from the sum of alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor.

d) These parameters do not have discharge permit levels, but are listed in the discharge permit because the parameters have been detected in the wastewater stream at concentrations less than 1 milligram per liter on average.

ug/L = micrograms per liter
NA = Not Applicable

Table 8

Storm Sewer Inspection - Sediment Waste Characterization Data
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Parameter	Sediment Concetration[a] (ug/kg)	Screening Level Value (SLV)[b] (ug/kg)
cis-1,2-Dichloroethene	18,000	**NA**
Ethylbenzene	8,000	**NA**
Tetrachloroethene	120,000	**500**
Toluene	22,000	**NA**
Trichloroethene	19,000	**2,100**
Total Xylenes	18,000	**NA**

Notes:

a) Sediment concentration reported in Progress Report 50 (VWR 1996) for characterization of 15 to 20 cubic yards of sediment generated during cleaning of the 42-inch storm sewer main on the eastern property boundary.

b) Screening level value listed in DEQ Guidance for Evaluating the Stormwater Pathway at Cleanup Sites - Appendix D, Public review draft. May 1, 2008 (DEQ 2008).

ug/kg = micrograms per kilogram
NA = Not Applicable

Table 9

Eastern Drive Soil Sampling Data
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Parameter	*Highest Soil* Concentration[a] (ug/kg)	Soil Screening Level Value[b] (ug/kg)
Arsenic	1,900	**7,000**
Barium	151,000	**NA**
Chromium	23,400	**111,000**
Lead	27,800	**17,000**
Mercury	60	**70**
gamma-chlordane	63	**0.37[c]**
alpha-chlordate	43	**0.37[c]**
Dieldrin	10	**0.0081**
4,4'-DDE	23	**0.33[d]**
4,4'-DDD	8	**0.33[e]**
4,4'-DDT	72	**0.33[f]**
Heptachlor	11	**10**
Acetone	220	**NA**
2-butanone (MEK)	39	**NA**
cis-1,2-Dichloroethene	530	**NA**
Tetrachloroethene	14,000	**500**
Toluene	9.5	**NA**
Trichloroethene	2,200	**2,100**
1,2,4-Trimethylbenzene	34	**NA**
m,p-Xylenes	22,000	**NA**
o-Xylene	11,000	**NA**
Pentachlorophenol	6.0	**1,000**
TPH - diesel range	41,000	**NA**
TPH - oil range	290,000	**NA**

Notes:

a) Highest soil concentration in soil samples collected in the top 18-inches in the eastern driveway.

b) Screening level value listed in DEQ Guidance for Evaluating the Stormwater Pathway at Cleanup Sites - Appendix D, Public review draft. May 1, 2008 (DEQ 2008).

c) The screening level value is calculated from the sum of alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor.

d) Screening level is for the sum of all isomers of DDE.

e) Screening level is for the sum of all isomers of DDD.

f) Screening level is for the sum of all isomers of DDT.

SLV = Screening Level Value
ug/kg = micrograms per kilogram
NA = Not Applicable

Table 10

Analytical Methods
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Method Number	Analysis	Container[a]		Preservative	Maximum Holding Time
		Type	Size		
Sediment Samples					
Plume et al 1981	Total organic carbon	Glass	16 oz.	4 ± 2°C	28 days
PSEP 1986	Percent solids			4 ± 2°C	6 months
PESP 1986	Grain Size			NA	NA
EPA 6020	Metals[b]			4 ± 2°C	6 months
EPA 7471A	Mercury			4 ± 2°C	28 days
EPA 8082 (LL)	PCB Arochlors	Glass	16 oz.	4 ± 2°C	7/40 days[c]
EPA 8081	Organochlorine pesticides			4 ± 2°C	7/40 days[c]
EPA 8270C	SVOCs			4 ± 2°C	7/40 days[c]
NWTPH-Dx	Diesel and Residual Range - TPH			4 ± 2°C	14/40 days[d]
EPA 8260b	VOCs	Glass	8 oz.	4 ± 2°C	14 days
Stormwater Samples					
EPA 160.2	Total suspended solids	Poly	1 liter	4 ± 2°C	7 days
EPA 415.1	Total organic carbon	Poly	250 ml	4 ± 2°C, H_2SO_4 to pH < 2	28 days
EPA 200.8	Total metals[b]	Poly	500 ml	4 ± 2°C, HNO_3 to pH < 2	6 months
EPA 1631M	Mercury	Poly	500 ml	4 ± 2°C, HNO_3 to pH < 2	28 days
SM-4500-CN-E	Cyanide	Poly	500 ml	4 ± 2°C, NaOH to pH > 12	14 days
EPA 1664	Oil and Grease (HEM)	Amber Glass	1 liter	4 ± 2°C, H_2SO_4 to pH < 2	28 days
EPA 8082 (LL)	PCB Arochlors	Amber Glass	1 liter	4 ± 2°C	7/40 days[c]
EPA 8081 (ULL)	Organochlorine pesticides	Amber Glass	1 liter	4 ± 2°C	7/40 days[c]
8270C	SVOCs	Amber Glass	1 liter	4 ± 2°C	7/40 days[c]
8270C (SIM)	PAHs			4 ± 2°C	7/40 days[c]
NWTPH-Dx	Diesel and Residual Range - TPH	Amber Glass	1 liter	4 ± 2°C	7/40 days[c]
EPA 8260b	VOCs	Glass	3 x 40 ml	4 ± 2°C, HCl to pH < 2	14 days

Notes:

a) The size and number of containers may be modified by the analytical laboratories.

b) Metals include Aluminum (Al), Antimony (Sb), Arsenic (As), Cadmium (Cd), Chromium (Ch), Copper (Cu), Lead (Pb), Manganese (Mn), Nickel (Ni), Selenium (Se), Silver (Ag), and Zinc (Zn).

c) The holding time is 7 days from collection to extraction, and 40 days from extraction to analysis.

d) The holding time is 14 days from collection to extraction, and 40 days from extraction to analysis.

FPC = Fluoropolycarbonate

Table 11

Reporting Limits and Screening Level Values
Univar Facility, Portland, Oregon

Analyte[a]	CAS Registry Number	Water Analyses Lab Method	Water Analyses MDL (ug/L)	Water Analyses MRL[b] (ug/L)	Water Analyses SLV (ug/L)	Sediment Analyses Lab Method	Sediment Analyses MDL (ug/kg)	Sediment Analyses MRL[b,c] (ug/kg)	Sediment Analyses SLV (ug/kg)
Metals and inoranics									
Aluminum	7429-90-5	200.8	0.3	2	87	6020	500	2000	NA
Antimony	7440-36-0	200.8	0.03	0.05	640	6020	30	50	64,000
Arsenic	7440-38-2	200.8	0.08	0.5	0.14	6020	10	500	7,000
Cadmium	7440-43-9	200.8	0.008	0.02	0.094	6020	8	20	1,000
Chromium (total)	7440-47-3	200.8	0.07	0.2	NA	6020	40	200	111,000
Copper	7440-50-8	200.8	0.02	0.1	2.7	6020	100	100	149,000
Lead	7439-92-1	200.8	0.009	0.02	0.54	6020	20	50	17,000
Manganese	7439-96-5	200.8	0.02	0.05	100	6020	40	50	1,100,000
Mercury	7439-97-6	1631M	0.00006	0.001	0.77	7471A	6.0	20	70
Nickel	7440-02-0	200.8	0.07	0.2	16	6020	50	200	48,600
Selenium	7782-49-2	200.8	0.4	1	5	6020	400	1000	5,000
Silver	7440-22-4	200.8	0.009	0.02	0.12	6020	20	20	5,000
Zinc	7440-66-6	200.8	0.1	0.5	36	6020	200	500	459,000
Cyanide	57-12-5	4500-CN-E	3	10	5.2	NA	NA	NA	NA
Polychlorinated Biphenyl (PCB) Arochlors									
Aroclor 1016	12674-11-2	8082 LL	0.011	0.02	NA	8082 LL	1.7	10	530
Aroclor 1221	11104-28-2	8082 LL	0.011	0.04	0.28	8082 LL	1.7	20	NA
Aroclor 1232	11141-16-5	8082 LL	0.011	0.02	0.58	8082 LL	1.7	10	NA
Aroclor 1242	NA	8082 LL	0.011	0.02	0.053	8082 LL	1.7	10	NA
Aroclor 1248	12672-29-6	8082 LL	0.011	0.02	0.081	8082 LL	1.7	10	1,500
Aroclor 1254	11097-69-1	8082 LL	0.011	0.02	0.033	8082 LL	1.7	10	300
Aroclor 1260	11096-82-5	8082 LL	0.011	0.02	94	8082 LL	1.7	10	200
Aroclor 1262	37324-23-5	8082 LL	0.011	0.02	NA	8082 LL	1.7	10	NA
Aroclor 1268	11100-14-4	8082 LL	0.011	0.02	NA	8082 LL	1.7	10	NA
Total PCBs (sum of Aroclor PCBs)	NA	8082 LL	0.011	0.02	0.000064	8082 LL	1.7	10	0.39

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Organochlorine Pesticides									
alpha-BHC	319-84-6	8081 ULL	0.00021	0.0005	0.0049	8081	0.26	1	NA
beta-BHC	319-85-7	8081 ULL	0.00041	0.0005	0.017	8081	0.3	1	NA
gamma-BHC (Lindane)	58-89-9	8081 ULL	0.00047	0.0005	0.08	8081	0.15	1	4.99
delta-BHC	319-86-8	8081 ULL	0.00014	0.0005	NA	8081	0.055	1	NA
Heptachlor	76-44-8	8081 ULL	0.00018	0.0005	0.000079	8081	0.08	1	10
Heptachlor epoxide	102-45-73	8081 ULL	0.00021	0.0005	0.000039	8081	0.13	1	16
Aldrin	309-00-2	8081 ULL	0.00011	0.0005	0.00005	8081	0.15	1	40
Chlordane - total[d]	57-74-9	8081 ULL	0.00031	0.0005	0.00081	8081	0.23	1	0.37
gamma-Chlordane	5103-71-9	8081 ULL	0.00031	0.0005	NA	8081	0.064	1	NA
alpha-Chlordane	5103-74-2	8081 ULL	0.00027	0.0005	NA	8081	0.23	1	NA
Oxychlordane	NA	8081 ULL	TBD	0.0005	NA	8081	TBD	1	NA
cis -Nonachlor	5103-73-1	8081 ULL	TBD	0.0005	NA	8081	TBD	1	NA
trans -Nonachlor	39765-80-5	8081 ULL	TBD	0.0005	NA	8081	TBD	1	NA
Endosulfan alpha-	959-98-8	8081 ULL	0.00025	0.0005	0.056	8081	0.17	1	NA
Endosulfan beta-	33213-65-9	8081 ULL	0.00035	0.0005	0.056	8081	0.19	1	NA
Endosulfan sulfate	1031-07-8	8081 ULL	0.00028	0.0005	89	8081	0.079	1	NA
DDE (sum 2,4' & 4,4')	NA	8081 ULL	0.00019	0.0005	0.00022	8081	0.1	1	0.33
2,4'-DDE	3424-82-6	8081 ULL	TBD	0.0005	NA	8081	TBD	1	NA
4,4'-DDE	72-55-9	8081 ULL	0.00019	0.0005	NA	8081	0.1	1	NA
DDD (sum 2,4' & 4,4')	NA	8081 ULL	0.00021	0.0005	0.00031	8081	0.12	1	0.33
2,4'-DDD	53-19-0	8081 ULL	TBD	0.0005	NA	8081	TBD	1	NA
4,4'-DDD	72-54-8	8081 ULL	0.00021	0.0005	NA	8081	0.12	1	NA
DDT (sum 2,4' & 4,4')	NA	8081 ULL	0.00017	0.0005	0.00022	8081	0.064	1	0.33
2,4'-DDT	789-02-6	8081 ULL	TBD	0.0005	NA	8081	TBD	1	NA
4,4'-DDT	50-29-3	8081 ULL	0.00017	0.0005	NA	8081	0.064	1	NA
DDT - total (sum DDE, DDE, & DDT)	50-29-3	8081 ULL	0.000212	0.0005	NA	8081	0.12	1	0.33
Dieldrin	60-57-1	8081 ULL	0.00037	0.0005	0.000054	8081	0.29	1	0.0081
Endrin	72-20-8	8081 ULL	0.00049	0.0005	0.036	8081	0.2	1	207
Endrin aldehyde	7421-93-4	8081 ULL	0.00021	0.0005	0.3	8081	0.053	1	NA
Endrin ketone	53494-70-5	8081 ULL	0.00032	0.0005	NA	8081	0.082	1	NA

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Methoxychlor	72-43-5	8081 ULL	0.00028	0.0005	0.03	8081	0.1	1	NA
Toxaphene	8001-35-2	8081	0.009	0.025	0.0002	8081	9.2	50	NA
Hexachlorobenzene	118-74-1	8081 ULL	TBD	0.0005	0.00029	8081	TBD	1	19
VOCs									
1,1,1,2-Tetrachloroethane	630-20-6	8260B	0.047	0.50	NA	8260B	0.076	5.0	NA
1,1,1-Trichloroethane (TCA)	71-55-6	8260B	0.050	0.50	11	8260B	0.066	5.0	NA
1,1,2,2-Tetrachloroethane	79-34-5	8260B	0.064	0.50	4	8260B	0.11	5.0	NA
1,1,2-Trichloroethane	79-00-5	8260B	0.061	0.50	16	8260B	0.11	5.0	NA
1,1-Dichloroethane	75-34-3	8260B	0.042	0.50	47	8260B	0.068	5.0	NA
1,2,3-Trichloropropane	96-18-4	8260B	0.14	0.50	NA	8260B	0.29	5.0	NA
1,2-Dichloroethane (EDC)	107-06-2	8260B	0.073	0.50	37	8260B	0.057	5.0	NA
1,2-Dichloropropane	78-87-5	8260B	0.042	0.50	15	8260B	0.094	5.0	NA
1,2-Dibromoethane (EDB)	106-93-4	8260B	0.084	2.0	NA	8260B	0.093	20	NA
2-Butanone (MEK)	78-93-3	8260B	3.8	20	NA	8260B	1.1	20	NA
2-Chloroethylvinylether	110-75-8	8260B	0.19	5	NA	8260B	0.31	10	NA
2-Hexanone	591-78-6	8260B	2.9	20	99	8260B	0.59	20	NA
4-Methyl-2-pentanone (MIBK)	108-10-1	8260B	3.0	20	170	8260B	0.22	20	NA
Acetone	67-64-1	8260B	2.5	20	1,500	8260B	1.8	20	NA
Acrolein	107-02-8	8260B	2.0	50	21	8260B	1.7	100	NA
Acrylonitrile	107-13-1	8260B	0.31	5	0.25	8260B	0.46	20	NA
Bromochloromethane	74-97-5	8260B	0.091	0.50	NA	8260B	0.18	5.0	NA
Bromodichloromethane	75-27-4	8260B	0.036	0.50	NA	8260B	0.11	5.0	NA
Bromoform	75-25-2	8260B	0.08	0.50	140	8260B	0.19	5.0	NA
Bromomethane	74-83-9	8260B	0.072	0.50	NA	8260B	0.51	5.0	NA
Carbon Disulfide	75-15-0	8260B	0.045	0.50	0.92	8260B	0.057	5.0	NA
Carbon Tetrachloride	56-23-5	8260B	0.068	0.50	1.6	8260B	0.072	5.0	NA
Chlorobenzene	108-90-7	8260B	0.045	0.50	50	8260B	0.051	5.0	NA
Dibromochloromethane	124-48-1	8260B	0.057	0.50	13	8260B	0.096	5.0	NA
Chloroethane	75-00-3	8260B	0.13	0.50	NA	8260B	0.24	5.0	NA
Chloroform	67-66-3	8260B	0.042	0.50	470	8260B	0.063	5.0	NA
Chloromethane	74-87-3	8260B	0.053	0.50	NA	8260B	0.11	5.0	NA

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cis-1,2-Dichloroethene	156-59-2	8260B	0.045	0.50	590	8260B	0.10	5.0	NA
cis-1,3-Dichloropropene	10061-01-5	8260B	0.038	0.50	0.055	8260B	0.056	5.0	NA
Dibromomethane	74-95-3	8260B	0.089	0.50	NA	8260B	0.15	5.0	NA
Dichlorodifluoromethane	75-71-8	8260B	0.083	0.50	NA	8260B	0.066	5.0	NA
Iodomethane	74-88-4	8260B	0.27	5	NA	8260B	0.35	20	NA
Isopropylbenzene	98-82-8	8260B	0.031	2.0	NA	8260B	0.050	20	NA
Dichloromethane	75-09-2	8260B	0.23	2.0	590	8260B	0.14	10	NA
Styrene	100-42-5	8260B	0.039	0.50	NA	8260B	0.067	5.0	NA
Trans-1,4-Dichloro-2-Butene	110-57-6	8260B	0.20	10	NA	8260B	0.41	20	NA
Trichlorofluoromethane	75-69-4	8260B	0.086	0.50	NA	8260B	0.11	5.0	NA
Vinyl Acetate	108-05-4	8260B	0.91	5	16	8260B	0.95	20	NA
Benzene	71-43-2	8260B	0.045	0.50	51	8260B	0.079	5.0	NA
Ethylbenzene	100-41-4	8260B	0.042	0.50	7.3	8260B	0.065	5.0	NA
m,p-Xylenes	179601-23-1	8260B	0.078	0.50	1.8	8260B	0.15	5.0	NA
o-Xylene	95-47-6	8260B	0.037	0.50	13	8260B	0.057	5.0	NA
Total Xylenes	1130-20-7	8260B	0.078	0.50	NA	8260B	0.15	5.0	NA
Tetrachloroethene (PCE)	127-18-4	8260B	0.077	0.50	3.3	8260B	0.076	5.0	500
Toluene	108-88-3	8260B	0.048	0.50	9.8	8260B	0.13	5.0	NA
trans-1,2-Dichloroethene	156-60-5	8260B	0.048	0.50	1000	8260B	0.084	5.0	NA
trans-1,3-Dichloropropene	10061-02-6	8260B	0.041	0.50	0.055	8260B	0.093	5.0	NA
Trichloroethene	79-01-6	8260B	0.061	0.50	3	8260B	0.07	5.0	2,100
Vinyl Chloride	75-01-4	8260B	0.071	0.50	2.4	8260B	0.094	5.0	NA
Dichlorodifluoromethane (CFC-12)	75-71-8	8260B	0.083	0.50	NA	8260B	0.073	5.5	NA
1,1-Dichloroethene	75-35-4	8260B	0.10	0.50	NA	8260B	0.057	5.0	NA
1,2,4-Trimethylbenzene	95-63-6	8260B	0.037	2.0	NA	8260B	0.070	20	NA
1,3,5-Trimethylbenzene	108-67-8	8260B	0.10	2.0	NA	8260B	0.069	20	NA
4-Isopropyltoluene	99-87-6	8260B	0.044	2.0	NA	8260B	0.066	20	NA
Naphthalene	91-20-3	8260B	0.10	2.0	620	8260B	0.14	20	NA
n-Butylbenzene	104-51-8	8260B	0.056	2.0	NA	8260B	0.096	20	NA
n-Propylbenzene	103-65-1	8260B	0.037	2.0	NA	8260B	0.054	20	NA
sec-Butylbenzene	135-98-8	8260B	0.036	2.0	NA	8260B	0.072	20	NA

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SVOCs									
Halogenated Compounds									
1,2-Dichlorobenzene	95-50-1	8270C	0.02	0.2	763	8270C	2.9	10	1,700
1,3-Dichlorobenzene	541-73-1	8270C	0.02	0.2	763	8270C	3.0	10	300
1,4-Dichlorobenzene	106-46-7	8270C	0.02	0.2	190	8270C	2.9	10	300
1,2,4-Trichlorobenzene	120-82-1	8270C	0.02	0.2	70	8270C	2.6	10	9,200
Hexachlorobenzene	118-74-1	8270C	0.02	0.2	0.00029	8270C	1.2	10	19
2-Chloronaphthalene	91-58-7	8270C	0.04	0.2	1600	8270C	1.6	10	NA
Hexachloroethane	67-72-1	8270C	0.02	0.2	3.3	8270C	3.1	10	NA
Hexachlorobutadiene	87-68-3	8270C	0.03	0.2	9.3	8270C	2.5	10	600
Hexachlorocyclopentadiene	77-47-4	8270C	0.19	1	5.2	8270C	29	50	400
Bis(2-chloroisopropyl) Ether	108-60-1	8270C	0.03	0.2	NA	8270C	2.6	10	NA
Bis(2-chloroethoxy)methane	111-91-1	8270C	0.02	0.2	NA	8270C	1.5	10	NA
Bis(2-chloroethyl) Ether	111-44-4	8270C	0.04	0.2	0.53	8270C	1.9	10	NA
4-Chlorophenyl Phenyl Ether	7005-72-3	8270C	0.03	0.2	NA	8270C	1.4	10	NA
4-Bromophenyl Phenyl Ether	101-55-3	8270C	0.03	2	NA	8270C	1.6	10	NA
3,3'-Dichlorobenzidine	91-94-1	8270C	0.43	2	0.028	8270C	3.7	100	NA
4-Chloroaniline	106-47-8	8270C	0.03	0.2	NA	8270C	1.9	10	NA
Organonitrogen Compounds									
Nitrobenzene	98-95-3	8270C	0.03	0.2	690	8270C	2.2	10	NA
2-Nitroaniline	88-74-4	8270C	0.02	0.2	NA	8270C	3.2	20	NA
3-Nitroaniline	99-09-2	8270C	0.03	1	NA	8270C	2.5	20	NA
4-Nitroaniline	100-01-6	8270C	0.02	1	NA	8270C	1.8	20	NA
N-Nitrosodimethylamine	62-75-9	8270C	TBD	TBD	3	8270C	TBD	TBD	NA
N-Nitrosodi-n-propylamine	621-64-7	8270C	0.04	0.2	0.51	8270C	2.4	10	NA
N-Nitrosodiphenylamine	86-30-6	8270C	0.05	0.2	6	8270C	1.6	10	NA
2,4-Dinitrotoluene	121-14-2	8270C	0.02	0.2	3.4	8270C	1.5	10	NA
2,6-Dinitrotoluene	606-20-2	8270C	0.03	0.2	NA	8270C	2.0	10	NA
Carbazole	86-74-8	8270C	TBD	0.2	NA	8270C	TBD	10	1,600

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Oxygen - Containing Compounds									
Benzoic Acid	65-85-0	8270C	1.1	5	42	8270C	96	200	NA
Benzyl Alcohol	100-51-6	8270C	0.07	5	8.6	8270C	2.1	20	NA
Dibenzofuran	132-64-9	8270C	0.02	0.2	3.7	8270C	1.2	10	NA
Isophorone	78-59-1	8270C	0.02	0.2	960	8270C	1.0	10	NA
Phenols and Substituted Phenols									
Phenol	108-95-2	8270C	0.06	0.5	2,560	8270C	2.0	30	50
2-Methylphenol (o-Cresol)	95-48-7	8270C	0.11	0.5	13	8270C	1.5	10	NA
4-Methylphenol (p-Cresol)	106-44-5	8270C	0.12	0.5	NA	8270C	1.5	10	NA
2,4-Dimethylphenol	105-67-9	8270C	2.2	4.0	850	8270C	5.5	50	NA
2-Chlorophenol	95-57-8	8270C	0.05	0.5	150	8270C	2.0	10	NA
2,4-Dichlorophenol	120-83-2	8270C	0.05	0.5	290	8270C	1.0	10	NA
2,4,5-Trichlorophenol	95-95-4	8270C	0.03	0.5	3,600	8270C	1.5	10	NA
2,4,6-Trichlorophenol	88-06-2	8270C	0.058	0.5	2.4	8270C	1.4	10	NA
Pentachlorophenol (PCP)	87-86-5	8270C	0.34	1.0	3	8270C	20.0	100	1,000
4-Chloro-3-methylphenol	59-50-7	8270C	0.04	0.5	NA	8270C	1.4	10	NA
2-Nitrophenol	88-75-5	8270C	0.06	0.5	150	8270C	1.5	10	NA
4-Nitrophenol	100-02-7	8270C	0.28	2.0	150	8270C	18	100	NA
2,4-Dinitrophenol	51-28-5	8270C	0.17	4.0	150	8270C	17	200	NA
2-Methyl-4,6-dinitrophenol	534-52-1	8270C	0.03	2.0	150	8270C	1.4	100	NA
Phthalate Esters									
Dimethyl Phthalate	131-11-3	8270C	0.02	0.2	3	8270C	1.0	10	NA
Diethyl Phthalate	84-66-2	8270C	0.01	0.2	3	8270C	1.3	10	600
Di-n-butyl Phthalate	84-74-2	8270C	0.02	0.2	3	8270C	7.9	20	100
Butyl Benzyl Phthalate	85-68-7	8270C	0.02	0.2	3	8270C	3.2	10	NA
Di-n-octyl Phthalate	117-84-0	8270C	0.02	0.2	3	8270C	1.7	10	NA
Bis(2-ethylhexyl) Phthalate	117-81-7	8270C	0.13	1.0	2.2	8270C	7.0	100	800
Polycyclic Aromatic Hydrocarbons									
Naphthalene	91-20-3	8270C SIM	0.003	0.02	620	8270C	2.3	10	561
2-Methylnaphthalene	91-57-6	8270C SIM	0.0023	0.02	2	8270C	2.2	10	200
Acenaphthylene	208-96-8	8270C SIM	0.0034	0.02	NA	8270C	1.2	10	200
Acenaphthene	83-32-9	8270C SIM	0.0044	0.02	520	8270C	1.4	10	300

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Fluorene	86-73-7	8270C SIM	0.0038	0.02	3.6	8270C	1.1	10	536
Phenanthrene	85-01-8	8270C SIM	0.0044	0.02	NA	8270C	1.4	10	1,170
Anthracene	120-12-7	8270C SIM	0.0036	0.02	40,000	8270C	1.6	10	845
Fluoranthene	206-44-0	8270C SIM	0.0044	0.02	140	8270C	1.6	10	2,230
Pyrene	129-00-0	8270C SIM	0.0035	0.02	4,000	8270C	1.5	10	1,520
Benz(a)anthracene	56-55-3	8270C SIM	0.0026	0.02	0.018	8270C	1.7	10	1,050
Chrysene	218-01-9	8270C SIM	0.0034	0.02	0.018	8270C	1.5	10	1,290
Benzo(b)fluoranthene	205-99-2	8270C SIM	0.0023	0.02	0.018	8270C	1.2	10	NA
Benzo(k)fluoranthene	207-08-9	8270C SIM	0.0025	0.02	0.018	8270C	1.4	10	13,000
Benzo(a)pyrene	50-32-8	8270C SIM	0.0043	0.02	0.018	8270C	1.7	10	1,450
Indeno(1,2,3-cd)pyrene	193-39-5	8270C SIM	0.0026	0.02	0.018	8270C	1.5	10	100
Dibenz(a,h)anthracene	53-70-3	8270C SIM	0.0025	0.02	0.018	8270C	1.5	10	1,300
Benzo(g,h,i)perylene	191-24-2	8270C SIM	0.0029	0.02	0.2	8270C	1.5	10	300
TPH Compounds									
Diesel range organics	NA	NWTPH-Dx	11	100	NA	NWTPH-Dx	1,200	25,000	NA
Residual range organics	NA	NWTPH-Dx	11	100	NA	NWTPH-Dx	2,900	100,000	NA
Oil and Grease									
Oil and Grease	NA	1664	1.1	5	NA	NA	NA	NA	NA

Notes:

a) **Highlighted** analytes are chemicals known to be associated with facility operations and/or site remedial activities, or have otherwise been detected in site soil and/or groundwater.

b) The MRL represents the level of the lowest calibration standard (i.e., the practical quantitation limit [PQL])

c) MRLs are highly matrix dependant and will vary with moisture content in the project samples. MRLs are provided for guidance and may not always be achievable.

d) Total chlordane will be calculated from the sum of alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor.

NA = Not Applicable
SIM = Selected Ion Monitoring
MDL = Method Detection Limit
MRL = Method Reporting Limit

SLV = Screening Level Value
ug/L = micrograms per liter
ug/kg = micrograms per kilogram
TBD = To Be Determined

Table 12

Field Equipment and Supplies
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Forms/Documentation
Field logbooks
Field sampling data sheets
Chain-of-custody/laboratory analysis report form
Custody seal
Project photo log
Health and Safety Plan (HASP)
Field sampling and analysis plan (SAP)
Large scale site map
Tools
Fiberglass tape with stainless-steel weight
PVC sampling pole
Tape measure calibrated to 0.1 inch
Decon brushes
Flashlight
Tool kit
Flashlight
Tool kit
Shovel
Stormwater Sampling Equipment
pH/conductivity meter
pH paper
Thermometers (°C)
Disposable plastic beakers
Sample containers and labels
Distilled Water
Sediment Sampling Equipment
Stainless-steel scoop, trowel or spoon
Bucket (hand) auger
Hand corer
Clam-shell dredge type sampler
Health and Safety Equipment
Fire extinguisher
First aid kits
Safety glasses
Eyewash
Ear plugs
Tyvek®
Gloves – vinyl, nitrile, and neoprene
Duct tape

Table 12

Field Equipment and Supplies
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Miscellaneous Equipment
Spray paint, pencils, pens, labels
Metal or wooden rod
Waterproof markers
Water jugs and sprayers
Hazardous materials packaging
Bubble wrap and tape for shipping
Cameras and film
Resealable plastic bags
Paper towels
Visqueen sheets
Buckets
Squirt bottle (wash)
Plastic funnel
Stainless-steel funnel
Cotton gloves
Nalgene wash bottles
Reagent bottles
Coolers (sample shipping)
Scrub brushes
Plastic tubs
Ice, in leak-proof bags
Drinking water

Table 13

Work Elements and QAPP Coverage Covered by Existing Plans
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

	Covered by Existing DCQAP[a]	Covered by Existing SAP/QAPP[b]	Covered by this Work Plan
Stormwater sampling	NA	NA	Section 8.4
Catch basin sampling	NA	NA	Section 8.3
Non-stormwater sampling	NA	NA	Section 8.5
Laboratory analysis of stormwater, non-stormwater, and catch basin sediment samples	NA	NA	Section 9.3
Decontamination and Disposal	Sections 10.1 and 10.2	Sections 3.7 and 3.8	Section 8.7
Sample Custody Procedures	Section 11.0	Section 3.5	Section 8.6
Data Reduction, Validation, and Reporting	Section 14.0	Section 4.0	Section 9.0

Notes:

a) Data Collection Quality Assurance Plan, Harding Lawson Associates, February 14, 1989 (HLA 1989).

b) Sampling and Analysis Plan and Quality Assurance Project Plan, IT Corporation, July 5, 2001 (ITC 2001).

Table 14

Laboratory and Field Quality Control Sample Summary
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Matrix	QA/QC Analyses	Frequency
Laboratory		
Sediment	Laboratory control sample (LCS)	Every analytical batch
	MS/MSD	1 per 20 project samples
	Method blank	Every analytical batch
Water	Laboratory control sample (LCS)	Every analytical batch
	MS/MSD	1 per 20 project samples
	Method blank	Every analytical batch
Field		
Sediment	Equipment blank/field rinsate	1 per 20 project sample or 1 per day when non-dedicated sampling equipment is used. Analyze for VOCs and phthalates.
	Trip blank	1 per cooler when samples are analyzed for VOCs
	Field duplicate	Optional (analyzed when addressing specific data concerns)
Water	Equipment blank/field rinsate	1 per 20 project sample or 1 per day when non-dedicated sampling equipment is used. Analyze for VOCs and phthalates.
	Trip blank	1 per cooler when samples are analyzed for VOCs
	Field duplicate	1 per 20 project samples

QC Acceptable Criteria
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Parameter[a]	Analyte	Water Accuracy (% R)	Water Precision (% RPD)	Sediment Accuracy (% R)	Sediment Precision (% RPD)
Conventional Analyses					
LCS/LCSD	Total organic carbon	90-109	20	85-115	20
	Total suspended solids	85-115	20	NA	NA
	Percent solids	NA	NA	NA	20
	Grain Size	NA	NA	82-110	± 10
MS/MSD	Total organic carbon	65-133	20	75-125	20
Metals and Inorganics					
LCS/LCSD	Aluminum	85-115	30	53-147	30
	Antimony	85-115	30	32-162	30
	Arsenic	85-115	30	80-115	30
	Cadmium	85-115	30	79-127	30
	Chromium (total)	85-115	30	77-127	30
	Copper	85-115	30	80-128	30
	Lead	85-115	30	81-129	30
	Manganese	85-115	30	80-120	30
	Mercury	77-123	24	75-118	30
	Nickel	85-115	30	83-131	30
	Selenium	85-115	30	84-133	30
	Silver	85-115	30	76-128	30
	Zinc	85-115	30	77-139	30
	Cyanide	90-110	30	NA	30
MS/MSD	Aluminum	70-130	30	70-130	30
	Antimony	70-130	30	10-125	30
	Arsenic	70-130	30	61-128	30
	Cadmium	70-130	30	79-127	30
	Chromium (total)	70-130	30	48-151	30
	Copper	70-130	30	44-153	30
	Lead	70-130	30	51-155	30
	Manganese	70-130	30	70-130	30
	Mercury	71-125	24	60-123	30
	Nickel	70-130	30	80-114	30
	Selenium	70-130	30	84-133	30
	Silver	70-130	30	76-128	30
	Zinc	70-130	30	77-139	30
	Cyanide	90 - 110	30	NA	30
PCB Arochlors					
LCS/LCSD	All target analytes	50-125	40	70-130	40
MS/MSD	All target analytes	37-137	40	60-140	40
Surrogates	Decachlorobiphenyl	10-144	NA	38-144	NA

QC Acceptable Criteria
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Parameter[a]	Analyte	Water Accuracy (% R)	Water Precision (% RPD)	Sediment Accuracy (% R)	Sediment Precision (% RPD)
Organochlorine Pesticides					
LCS/LCSD	alpha-BHC	43-127	40	45-150	40
	beta-BHC	41-129	40	47-149	40
	gamma-BHC (Lindane)	42-128	40	48-146	40
	delta-BHC	47-141	40	59-162	40
	Heptachlor	34-126	40	47-142	40
	Heptachlor epoxide	45-124	40	48-140	40
	Aldrin	10-125	40	43-141	40
	gamma-Chlordane	48-119	40	42-145	40
	alpha-Chlordane	48-119	40	42-145	40
	Endosulfan alpha-	30-115	40	36-124	40
	Endosulfan beta-	32-123	40	42-130	40
	Endosulfan sulfate	46-120	40	48-143	40
	2,4'-DDE	TBD	40	TBD	40
	4,4'-DDE	36-137	40	51-149	40
	2,4'-DDD	TBD	40	TBD	40
	4,4'-DDD	38-140	40	51-152	40
	2,4'-DDT	TBD	40	TBD	40
	4,4'-DDT	45-146	40	59-151	40
	Dieldrin	50-120	40	50-142	40
	Endrin	53-132	40	54-155	40
	Endrin aldehyde	30-114	40	31-139	40
	Endrin ketone	45-127	40	41-158	40
	Methoxychlor	48-140	40	55-153	40
	Toxaphene	37-142	40	37-155	40
	Oxychlordane	TBD	40	TBD	40
	cis -Nonachlor	TBD	40	TBD	40
	trans -Nonachlor	TBD	40	TBD	40
	Hexachlorobenzene	TBD	40	TBD	40
MS/MSD	alpha-BHC	30-126	40	36-145	40
	beta-BHC	28-121	40	38-148	40
	gamma-BHC (Lindane)	30-126	40	33-154	40
	delta-BHC	35-138	40	40-164	40
	Heptachlor	21-127	40	38-145	40
	Heptachlor epoxide	24-132	40	29-150	40
	Aldrin	11-124	40	37-143	40
	gamma-Chlordane	35-121	40	27-149	40
	alpha-Chlordane	25-134	40	33-141	40
	Endosulfan alpha-	23-109	40	18-133	40
	Endosulfan beta-	23-119	40	19-147	40
	Endosulfan sulfate	25-130	40	28-149	40
	2,4'-DDE	TBD	40	TBD	40
	4,4'-DDE	21-139	40	32-156	40
	2,4'-DDD	TBD	40	TBD	40
	4,4'-DDD	22-141	40	26-161	40
	2,4'-DDT	TBD	40	TBD	40
	4,4'-DDT	30-143	40	22-174	40
	Dieldrin	25-134	40	37-146	40
	Endrin	35-137	40	34-161	40
	Endrin aldehyde	10-126	40	11-147	40

Table 15

QC Acceptable Criteria
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Parameter[a]	Analyte	Water Accuracy (% R)	Water Precision (% RPD)	Sediment Accuracy (% R)	Sediment Precision (% RPD)
	Endrin ketone	38-117	40	36-149	40
	Methoxychlor	38-134	40	37-162	40
	Toxaphene	25-134	40	10-184	40
	Oxychlordane	TBD	40	TBD	40
	cis -Nonachlor	TBD	40	TBD	40
	trans -Nonachlor	TBD	40	TBD	40
	Hexachlorobenzene	TBD	40	TBD	40
Surrogates	Tetrachloro-m -xylene	10-121	NA	25-125	NA
	Decachlorobiphenyl	17-150	NA	22-142	NA
VOCs					
LCS/LCSD	1,1-Dichloroethene	80-134	40	80-134	40
	1,2-Dichloropropane	79-118	40	79-118	40
	Benzene	75-126	40	75-126	40
	Chlorobenzene	78-106	40	78-106	40
	Chloroform	78-117	40	78-117	40
	Ethylbenzene	79-111	40	79-111	40
	Trichloroethene	81-119	40	81-119	40
	Toluene	77-115	40	77-115	40
	Vinyl Chloride	58-136	40	58-136	40
MS/MSD	1,1-Dichloroethene	40-148	40	40-148	40
	Benzene	38-132	40	38-132	40
	Chlorobenzene	19-129	40	19-129	40
	Trichloroethene	32-135	40	32-135	40
	Toluene	26-133	40	26-133	40
Surrogates	d4-1,2-Dichloroethane	60-120	NA	60-120	NA
	Toluene-D8	63-116	NA	63-116	NA
	4-Bromofluorobenzene	58-117	NA	58-117	NA
	Dimbromofluoromethane	61-116	NA	61-116	NA
SVOCs					
LCS/LCSD	N-Nitrosodimethylamine	30-115	40	20-100	40
	Bis(2-chloroethyl) Ether	30-125	40	22-98	40
	Phenol	32-117	40	34-101	40
	2-Chlorophenol	32-117	40	30-91	40
	1,3-Dichlorobenzene	10-79	40	10-97	40
	1,4-Dichlorobenzene	10-81	40	10-98	40
	1,2-Dichlorobenzene	15-86	40	10-98	40
	Benzyl Alcohol	33-119	40	30-101	40
	Bis(2-chloroisopropyl) Ether	29-116	40	17-100	40
	2-Methylphenol	29-115	40	10-93	40
	Hexachloroethane	10-76	40	10-99	40
	N-Nitrosodi-n-propylamine	TBD	40	10-103	40
	4-Methylphenol	30-116	40	10-98	40
	Nitrobenzene	34-122	40	22-99	40
	Isophorone	33-121	40	35-91	40
	2-Nitrophenol	33-120	40	30-98	40
	2,4-Dimethylphenol	10-116	40	10-81	40
	Bis(2-chloroethoxy)methane	34-119	40	34-93	40
	2,4-Dichlorophenol	33-120	40	35-91	40
	Benzoic Acid	10-118	40	10-50	40

Table 15

QC Acceptable Criteria
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Parameter[a]	Analyte	Water Accuracy (% R)	Water Precision (% RPD)	Sediment Accuracy (% R)	Sediment Precision (% RPD)
	1,2,4-Trichlorobenzene	14-88	40	18-96	40
	Naphthalene	49-108	40	23-95	40
	4-Chloroaniline	10-110	40	10-95	40
	Hexachlorobutadiene	10-75	40	14-100	40
	4-Chloro-3-methylphenol	37-120	40	28-98	40
	2-Methylnaphthalene	40-113	40	30-92	40
	Hexachlorocyclopentadiene	10-54	40	10-81	40
	2,4,6-Trichlorophenol	34-118	40	31-96	40
	2,4,5-Trichlorophenol	36-119	40	38-95	40
	2-Chloronaphthalene	30-108	40	33-95	40
	2-Nitroaniline	35-122	40	40-104	40
	Acenaphthylene	56-113	40	38-99	40
	Dimethyl Phthalate	43-116	40	44-99	40
	2,6-Dinitrotoluene	42-120	40	42-100	40
	Acenaphthene	56-111	40	39-90	40
	3-Nitroaniline	24-115	40	28-100	40
	2,4-Dinitrophenol	10-121	40	14-104	40
	Dibenzofuran	59-114	40	40-91	40
	4-Nitrophenol	33-136	40	42-115	40
	2,4-Dinitrotoluene	43-124	40	43-106	40
	Fluorene	61-114	40	41-94	40
	4-Chlorophenyl Phenyl Ether	36-112	40	41-93	40
	Diethyl Phthalate	42-120	40	46-104	40
	4-Nitroaniline	23-120	40	29-107	40
	4,6-Dinitro-2-methylphenol	24-123	40	30-107	40
	N-Nitrosodiphenylamine	30-115	40	20-100	40
	4-Bromophenyl Phenyl Ether	40-113	40	42-97	40
	Hexachlorobenzene	40-114	40	42-98	40
	Pentachlorophenol	24-123	40	28-100	40
	Phenanthrene	58-116	40	44-97	40
	Anthracene	48-115	40	31-104	40
	Di-n-butyl Phthalate	46-119	40	47-129	40
	Fluoranthene	61-130	40	45-111	40
	Pyrene	56-118	40	46-112	40
	Butyl Benzyl Phthalate	43-121	40	50-119	40
	3,3'-Dichlorobenzidine	10-101	40	10-112	40
	Benz(a)anthracene	55-118	40	45-110	40
	Chrysene	61-119	40	50-108	40
	Bis(2-ethylhexyl) Phthalate	34-136	40	48-127	40
	Di-n-octyl Phthalate	39-123	40	52-126	40
	Benzo(b)fluoranthene	57-124	40	51-111	40
	Benzo(k)fluoranthene	65-121	40	52-109	40
	Benzo(a)pyrene	44-122	40	26-125	40
	Indeno(1,2,3-cd)pyrene	44-132	40	47-119	40
	Dibenz(a,h)anthracene	51-131	40	50-115	40
	Benzo(g,h,i)perylene	55-122	40	43-115	40
MS/MSD	N-Nitrosodimethylamine	10-128	40	10-129	NA
	Bis(2-chloroethyl) Ether	27-120	40	14-112	NA
	Phenol	10-145	40	10-120	NA
	2-Chlorophenol	27-118	40	12-105	NA

Table 15

QC Acceptable Criteria
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Parameter[a]	Analyte	Water Accuracy (% R)	Water Precision (% RPD)	Sediment Accuracy (% R)	Sediment Precision (% RPD)
	1,3-Dichlorobenzene	10-68	40	10-106	NA
	1,4-Dichlorobenzene	10-72	40	10-105	NA
	1,2-Dichlorobenzene	10-78	40	10-101	NA
	Benzyl Alcohol	25-125	40	22-107	NA
	Bis(2-chloroisopropyl) Ether	23-114	40	10-105	NA
	2-Methylphenol	20-125	40	10-99	NA
	Hexachloroethane	10-82	40	10-103	NA
	N-Nitrosodi-n-propylamine	TBD	40	10-111	NA
	4-Methylphenol	10-144	40	10-110	NA
	Nitrobenzene	23-139	40	16-105	NA
	Isophorone	23-124	40	27-95	NA
	2-Nitrophenol	31-120	40	26-99	NA
	2,4-Dimethylphenol	10-148	40	10-103	NA
	Bis(2-chloroethoxy)methane	34-115	40	29-96	NA
	2,4-Dichlorophenol	22-129	40	10-118	NA
	Benzoic Acid	10-181	40	10-144	NA
	1,2,4-Trichlorobenzene	15-83	40	10-102	NA
	Naphthalene	41-119	40	10-115	NA
	4-Chloroaniline	10-81	40	10-75	NA
	Hexachlorobutadiene	10-69	40	10-96	NA
	4-Chloro-3-methylphenol	12-141	40	10-119	NA
	2-Methylnaphthalene	34-118	40	10-116	NA
	Hexachlorocyclopentadiene	10-54	40	10-74	NA
	2,4,6-Trichlorophenol	28-123	40	20-112	NA
	2,4,5-Trichlorophenol	25-131	40	20-112	NA
	2-Chloronaphthalene	27-113	40	14-114	NA
	2-Nitroaniline	10-138	40	31-112	NA
	Acenaphthylene	44-126	40	19-113	NA
	Dimethyl Phthalate	39-121	40	12-134	NA
	2,6-Dinitrotoluene	39-129	40	28-116	NA
	Acenaphthene	46-121	40	23-106	NA
	3-Nitroaniline	10-104	40	10-105	NA
	2,4-Dinitrophenol	15-181	40	10-156	NA
	Dibenzofuran	43-126	40	10-132	NA
	4-Nitrophenol	43-140	40	11-143	NA
	2,4-Dinitrotoluene	28-136	40	22-125	NA
	Fluorene	51-124	40	12-127	NA
	4-Chlorophenyl Phenyl Ether	34-111	40	23-112	NA
	Diethyl Phthalate	41-124	40	26-120	NA
	4-Nitroaniline	10-103	40	10-117	NA
	4,6-Dinitro-2-methylphenol	25-142	40	10-135	NA
	N-Nitrosodiphenylamine	10-128	40	10-129	NA
	4-Bromophenyl Phenyl Ether	39-112	40	31-111	NA
	Hexachlorobenzene	37-114	40	26-113	NA
	Pentachlorophenol	30-148	40	10-146	NA
	Phenanthrene	52-154	40	10-135	NA
	Anthracene	33-129	40	10-124	NA
	Di-n-butyl Phthalate	38-121	40	25-135	NA
	Fluoranthene	46-139	40	10-160	NA
	Pyrene	45-131	40	10-146	NA

Table 15

QC Acceptable Criteria
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

Parameter[a]	Analyte	Water Accuracy (% R)	Water Precision (% RPD)	Sediment Accuracy (% R)	Sediment Precision (% RPD)
	Butyl Benzyl Phthalate	30-137	40	31-130	NA
	3,3'-Dichlorobenzidine	70-130	40	10-82	NA
	Benz(a)anthracene	37-131	40	13-135	NA
	Chrysene	44-131	40	10-142	NA
	Bis(2-ethylhexyl) Phthalate	10-155	40	12-154	NA
	Di-n-octyl Phthalate	17-155	40	17-158	NA
	Benzo(b)fluoranthene	29-145	40	11-141	NA
	Benzo(k)fluoranthene	33-143	40	22-128	NA
	Benzo(a)pyrene	23-137	40	10-150	NA
	Indeno(1,2,3-cd)pyrene	25-144	40	16-141	NA
	Dibenz(a,h)anthracene	27-145	40	23-133	NA
	Benzo(g,h,i)perylene	29-137	40	13-137	NA
SVOC Surrogates	2,4,6-Tribromophenol	22-148	NA	16-122	NA
	2-Fluorobiphenyl	26-114	NA	10-105	NA
	2-Fluorophenol	16-122	NA	10-89	NA
	Nitrobenzene-d5	24-131	NA	10-100	NA
	Phenol-d6	25-118	NA	15-103	NA
	Terphenyl-d14	28-144	NA	31-126	NA
TPH Compounds and Oil & Grease					
LCS/LCSD	Diesel range organics	55-132	40	63-133	40
	Residual range organics	54-14	40	69-124	40
Surrogates	o-Terphenyl	50-150	NA	50-150	NA
	n-triacontane	50-150	NA	50-150	NA
Oil and Grease					
LCS/LCSD	Oil and Grease	78-114	40	NA	NA

Notes:

a) Control limits are updated periodically by the laboratories. Control limits that are in effect at the laboratory at the time of analysis will be used for sample analysis and data validation. These may differ slightly from the control limits shown in this table.

LCS = Laboratory Control Sample
LCSD = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
NA = Not Applicable
TBD = To Be Determined

Table 16

Laboratory Deliverables
Stormwater Pathway Investigation Work Plan
Univar Facility, Portland, Oregon

The following deliverables will be required from the laboratory:

1) A transmittal letter and case narrative which includes information about receipt of the samples, the analytical results, and any significant problems in any aspect of sample analysis (e.g., deviation from methodologies or quality control).

2) Sample analytical results:
    a) Water results in mg/L or µg/L
    b) Soil results in mg/kg or µg/kg
    c) Method reporting limit for undetected values reported for each analyte on a sample-by-sample basis
    d) Date of sample preparation/extraction
    e) Date of sample analysis

3) Method blank results, including the samples associated with each blank

4) Surrogate recovery results, reported as percent recoveries, including actual spike levels

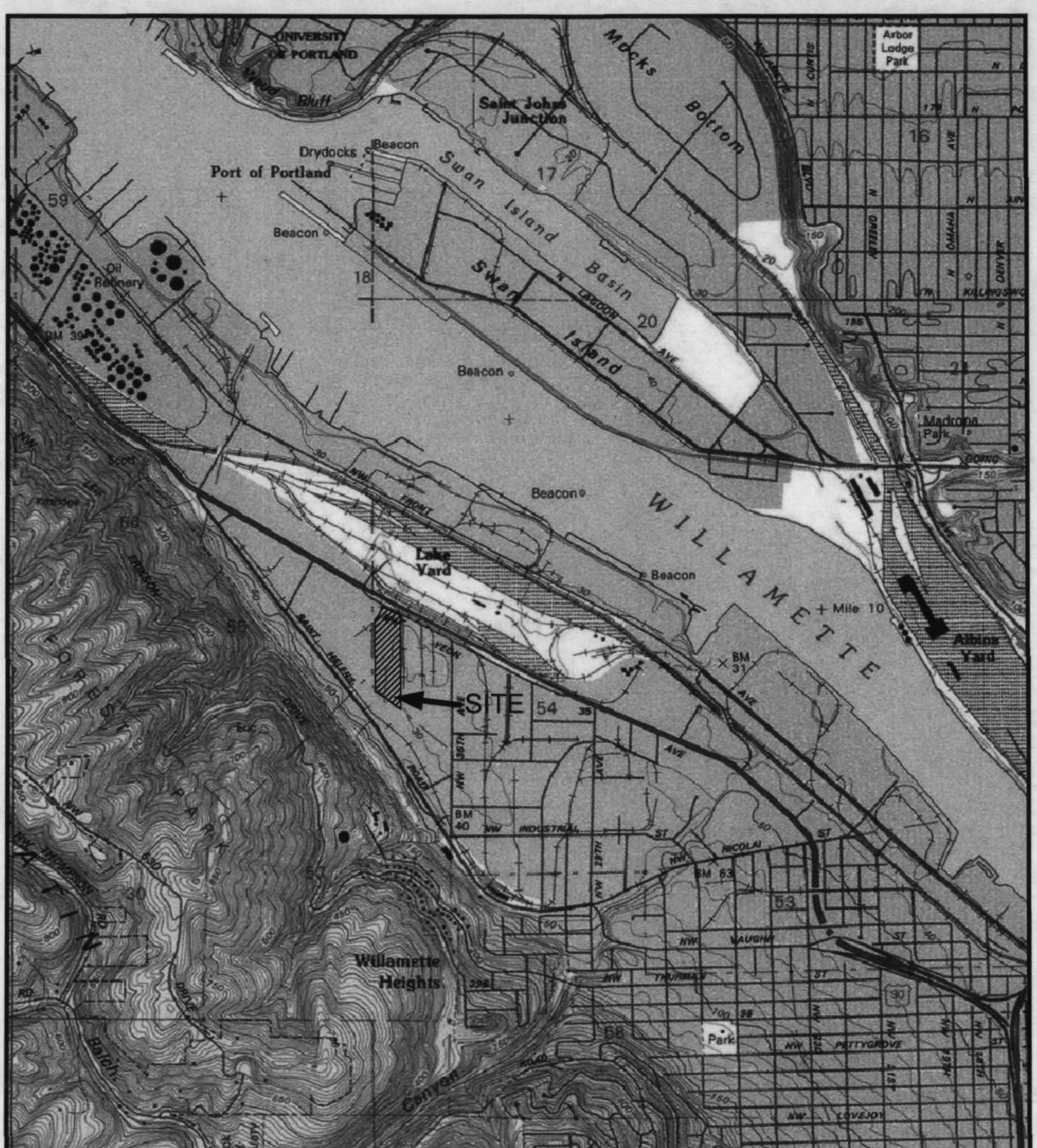
5) Laboratory duplicate results

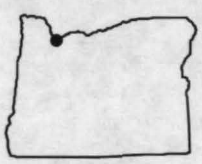
6) MS/MSD results, reported as percent recoveries, including actual spike levels

7) Copies of signed chain-of-custody forms

ILLUSTRATIONS

FIGURES





N

S C A L E

0 2000 4000 FEET

SOURCE:

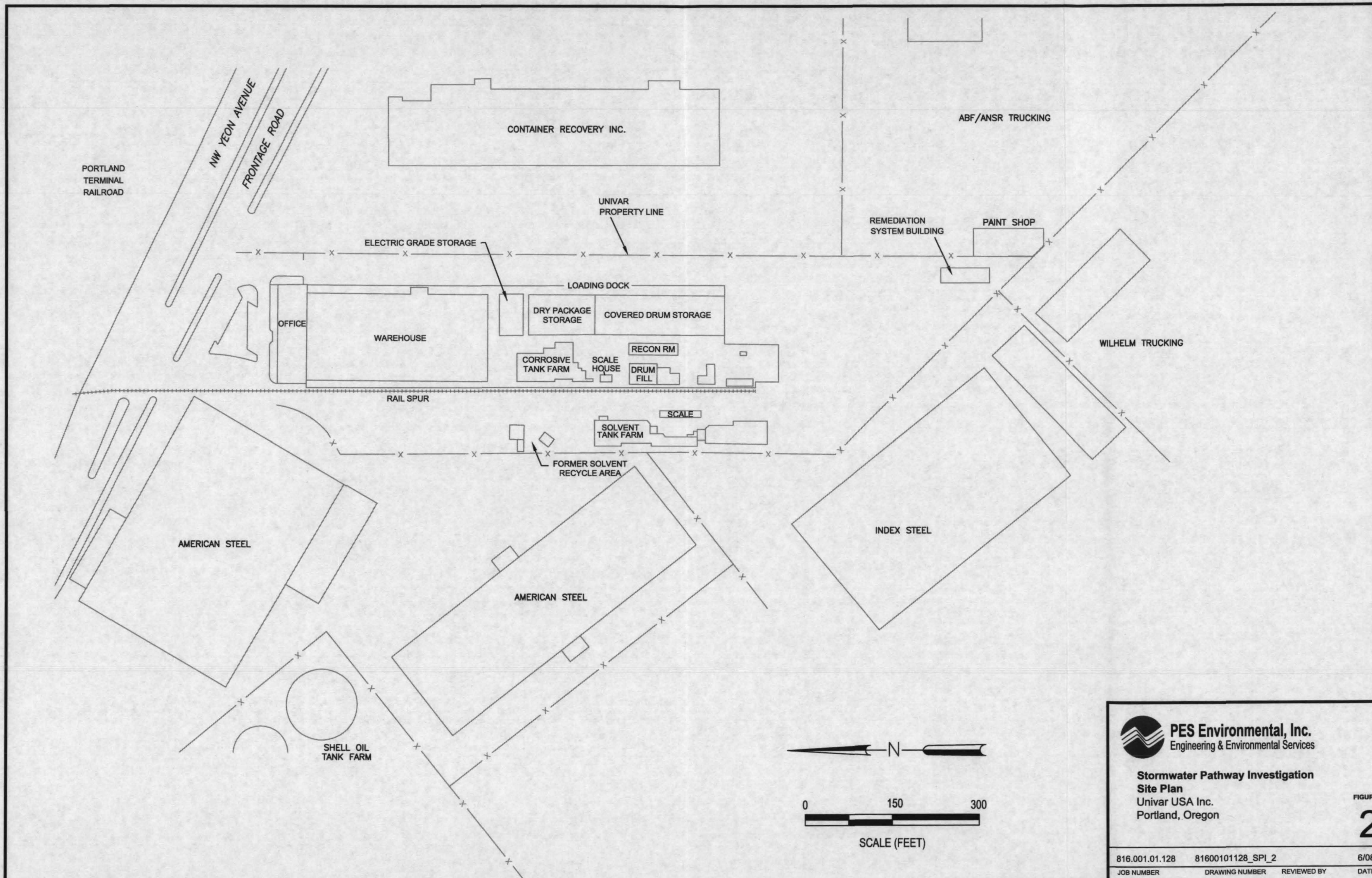
U.S.G.S. 7.5 Min. Quadrangle, PORTLAND, OR – WA 1961.

PES Environmental, Inc.
Engineering & Environmental Services

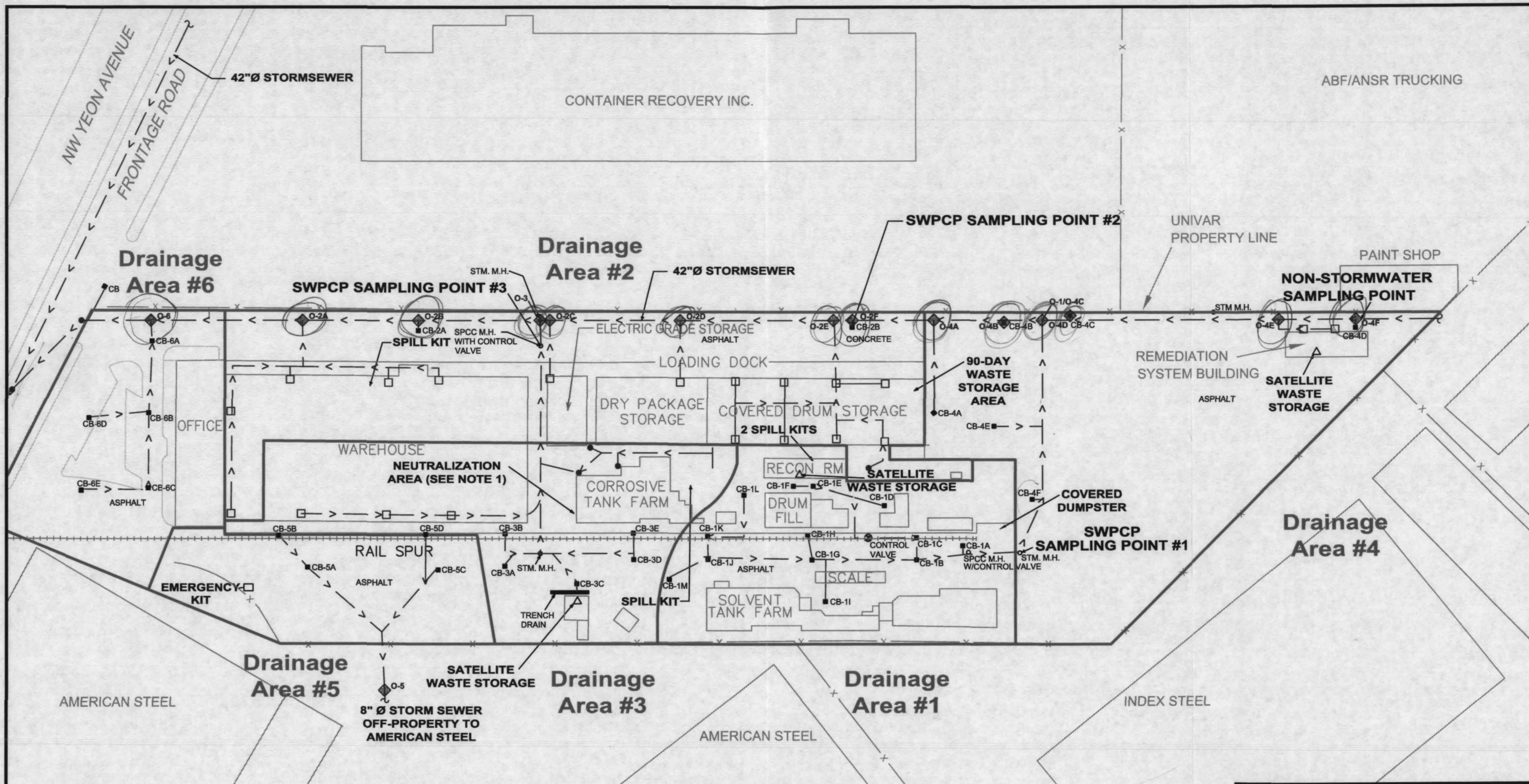
Stormwater Pathway Investigation
Site Location Map
Univar USA Inc.
Portland, Oregon

FIGURE
1

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
816.001.01.128	81600101128_SPI_1		4/08



CONTAINER RECOVERY INC.
ABF/ANSR TRUCKING
PORTLAND
TERMINAL
RAILROAD
NW YEON AVENUE
FRONTAGE ROAD
UNIVAR
PROPERTY LINE
REMEDIATION
SYSTEM BUILDING
PAINT SHOP
ELECTRIC GRADE STORAGE
LOADING DOCK
OFFICE
WAREHOUSE
DRY PACKAGE
STORAGE
COVERED DRUM STORAGE
RECON RM
CORROSIVE
TANK FARM
SCALE
HOUSE
DRUM
FILL
WILHELM TRUCKING
RAIL SPUR
SCALE
SOLVENT
TANK FARM
FORMER SOLVENT
RECYCLE AREA
AMERICAN STEEL
INDEX STEEL
AMERICAN STEEL
SHELL OIL
TANK FARM
N
0
150
300
SCALE (FEET)
PES Environmental, Inc.
Engineering & Environmental Services
Stormwater Pathway Investigation
Site Plan
Univar USA Inc.
Portland, Oregon
FIGURE
2
816.001.01.128
81600101128_SPI_2
6/08
JOB NUMBER
DRAWING NUMBER
REVIEWED BY
DATE



Explanation

- STORM DRAIN WITH FLOW DIRECTION
- OUTFALL (O-2A)
- CATCH BASIN (CB)
- MANHOLE
- SATELLITE WASTE STORAGE
- FLOOR DRAIN
- ROOF DRAIN

NOTES:
1) NEUTRALIZATION AREA GRAVITY DRAINS TO SANITARY SEWER

SITE DRAINAGE STRUCTURES

Drainage Area	Outfalls	Catch Basins
1	O-1 / O-4C	CB-1A through CB-1M
2	O-2A through O-2F	CB-2A and CB-2B
3	O-3	CB-3A through CB-3E
4	O-4A through O-4F	CB-4A through CB-4F
5	O-5	CB-5A through CB-5D
6	O-6	CB-6A through CB-6E

N

0 100 200

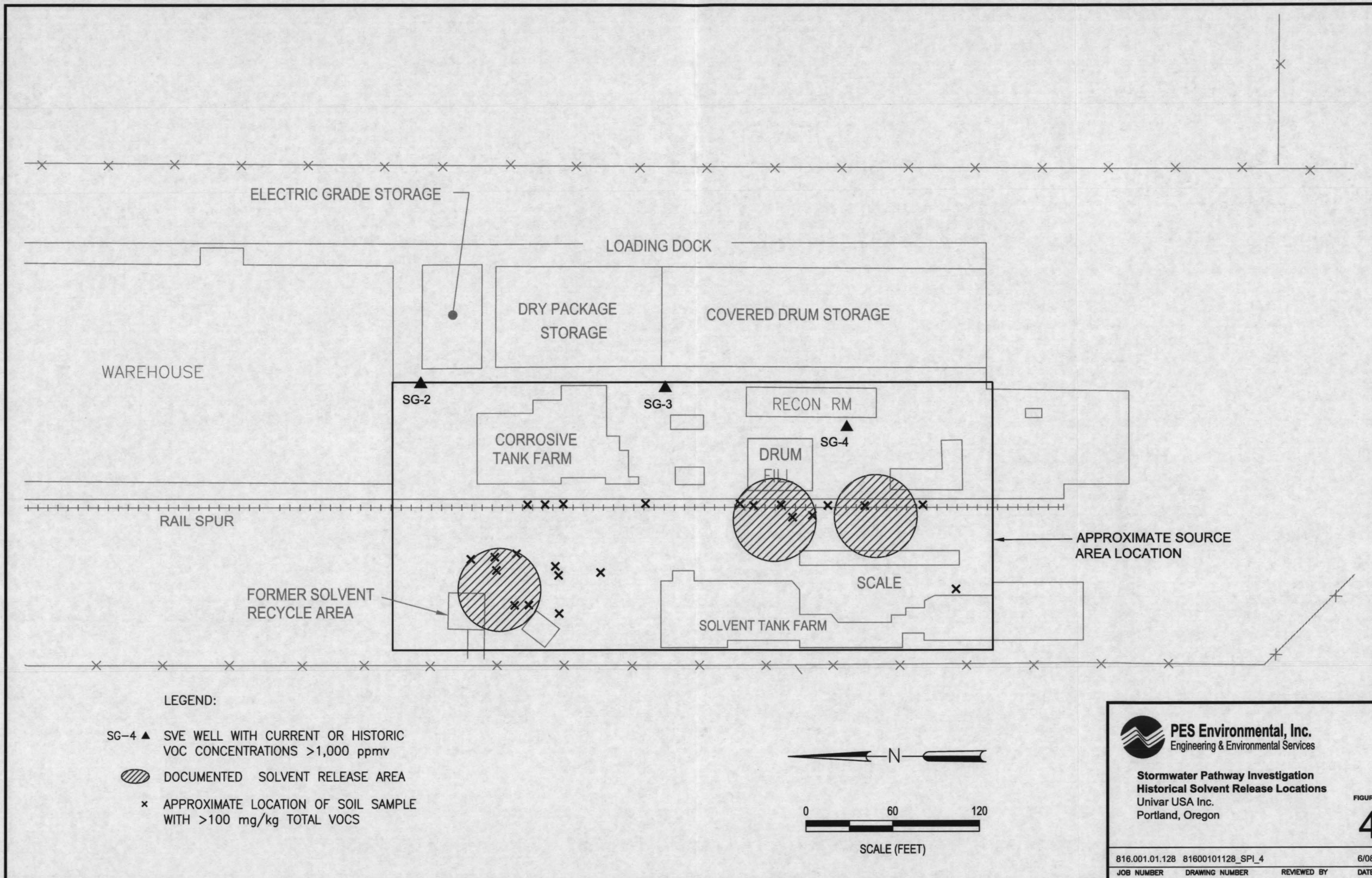
SCALE (FEET)

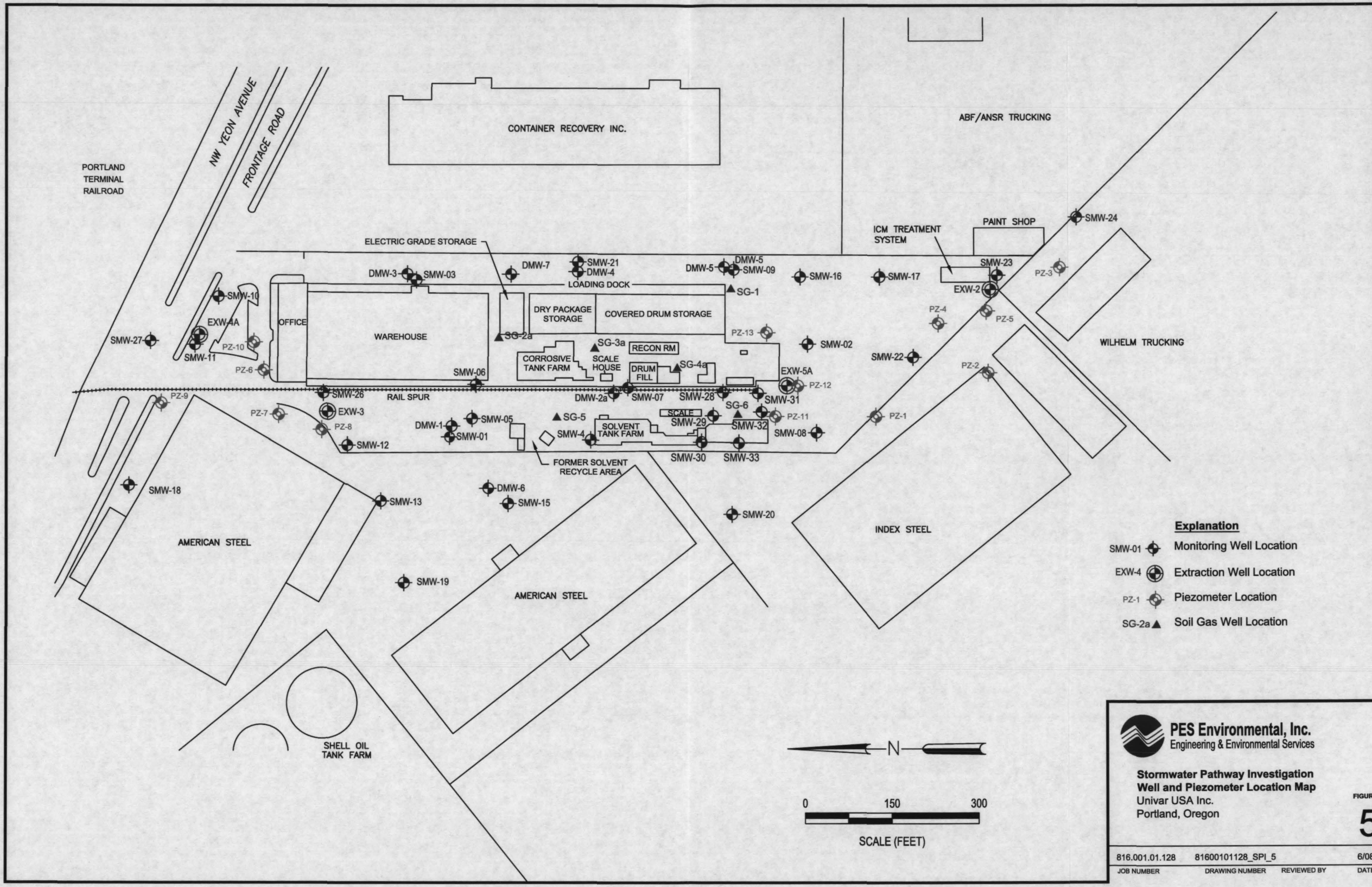
PES Environmental, Inc.
Engineering & Environmental Services

Stormwater Pathway Investigation
Site Drainage Map
Univar USA Inc.
Portland, Oregon

FIGURE
3

816.001.01.128	81600101128_SPI_3		6/08
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE


ELECTRIC GRADE STORAGE
LOADING DOCK
DRY PACKAGE STORAGE
COVERED DRUM STORAGE
WAREHOUSE
SG-2
SG-3
RECON RM
SG-4
CORROSIVE TANK FARM
DRUM FILL
RAIL SPUR
APPROXIMATE SOURCE AREA LOCATION
FORMER SOLVENT RECYCLE AREA
SCALE
SOLVENT TANK FARM
LEGEND:
SG-4 ▲ SVE WELL WITH CURRENT OR HISTORIC VOC CONCENTRATIONS >1,000 ppmv
DOCUMENTED SOLVENT RELEASE AREA
× APPROXIMATE LOCATION OF SOIL SAMPLE WITH >100 mg/kg TOTAL VOCS
N
0
60
120
SCALE (FEET)
PES Environmental, Inc.
Engineering & Environmental Services
Stormwater Pathway Investigation
Historical Solvent Release Locations
Univar USA Inc.
Portland, Oregon
FIGURE
4
816.001.01.128
81600101128_SPI_4
6/08
JOB NUMBER
DRAWING NUMBER
REVIEWED BY
DATE


PORTLAND TERMINAL RAILROAD
NW YEON AVENUE
FRONTAGE ROAD
CONTAINER RECOVERY INC.
ABF/ANSR TRUCKING
PAINT SHOP
ICM TREATMENT SYSTEM
WILHELM TRUCKING
INDEX STEEL
AMERICAN STEEL
AMERICAN STEEL
SHELL OIL TANK FARM
ELECTRIC GRADE STORAGE
LOADING DOCK
OFFICE
WAREHOUSE
DRY PACKAGE STORAGE
COVERED DRUM STORAGE
CORROSIVE TANK FARM
SCALE HOUSE
RECON RM
DRUM FILL
RAIL SPUR
SCALE
SOLVENT TANK FARM
FORMER SOLVENT RECYCLE AREA
SMW-10
EXW-4A
SMW-27
SMW-11
PZ-10
PZ-6
PZ-9
PZ-7
PZ-8
EXW-3
SMW-26
SMW-12
SMW-18
SMW-13
SMW-19
DMW-3
SMW-03
DMW-7
SMW-21
DMW-4
DMW-5
DMW-5
SMW-09
SG-1
SMW-16
SMW-17
SMW-23
EXW-2
PZ-3
SMW-24
PZ-4
PZ-5
PZ-13
SMW-02
SMW-22
PZ-2
SG-2a
SG-3a
SG-4a
SMW-06
EXW-5A
PZ-12
DMW-2a
SMW-07
SMW-28
SMW-31
SG-6
PZ-11
PZ-1
SMW-29
SMW-32
SMW-08
SMW-30
SMW-33
SG-5
SMW-4
DMW-1
SMW-05
SMW-01
DMW-6
SMW-15
SMW-20
N
0
150
300
SCALE (FEET)
Explanation
SMW-01 Monitoring Well Location
EXW-4 Extraction Well Location
PZ-1 Piezometer Location
SG-2a Soil Gas Well Location
PES Environmental, Inc.
Engineering & Environmental Services
Stormwater Pathway Investigation
Well and Piezometer Location Map
Univar USA Inc.
Portland, Oregon
FIGURE
5
816.001.01.128
81600101128_SPI_5
6/08
JOB NUMBER
DRAWING NUMBER
REVIEWED BY
DATE

APPENDIX A

APPENDIX A

CITY OF PORTLAND BES LETTER

— CITY OF PORTLAND —
ENVIRONMENTAL SERVICES
1120 SW Fifth Avenue, Room 1000, Portland, Oregon 97204-1912 ▪ Sam Adams, Commissioner ▪ Dean Marriott, Director

September 22, 2006

Mr. Howard Orlean
U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue, AWT-121
Seattle, WA 98101

Subject: Univar USA, Inc Facility
City of Portland Bureau of Environmental Services Comments on EPA Proposed Final RCRA Corrective Measures Remedy

Dear Mr. Orlean:

The City of Portland Bureau of Environmental Services (BES) is providing comments on the U.S. Environmental Protection Agency's (EPAs) proposed Statement of Basis Proposed Resource Conservation and Recovery Act (RCRA) Remedy Selection for the Univar USA, Inc. (formerly Van Waters & Rogers) facility located at 3950 NW Yeon Avenue, Portland, Oregon. BES appreciates the opportunity to comment and hopes that based on our comments below, EPA will conduct an appropriate investigation of the stormwater pathway prior to finalizing the RCRA remedy for Univar USA, Inc. according to the EPA's and Oregon Department of Environmental Quality's (DEQ's) Joint Source Control Strategy (JSCS) (EPA / DEQ , 2006) for the Portland Harbor Superfund Site and the Memorandum of Understanding between EPA, DEQ and other governmental parties dated February 8, 2001.

As you are aware, the Univar site is located with the Portland Harbor Superfund Site. Specifically, it is located within the City of Portland's stormwater drainage Basin 18 which discharges through Outfall 18 into the Willamette River at approximately River Mile 8.7. Because discharge from the Univar industrial facility drains into the City's stormwater conveyance system, it is critical that this upland facility thoroughly evaluate offsite migration through the site's stormwater pathway(s). This evaluation is necessary to implement the JSCS and to meet the site's corrective action objective to "[p]revent migration of COCs to the Willamette River."

Our review of the RCRA site investigations and corrective action documents, BES correspondence regarding spills and the NPDES permit, Portland Harbor sediment data, and BES inline sampling data collected in this vicinity indicate that the facility's stormwater pathway has not been fully investigated or addressed in the proposed remedy. Our review also found significant evidence of the release and offsite migration through the site's stormwater conveyance systems of hazardous substances handled at the facility. Presented below is information that demonstrates the need for characterization of the stormwater pathway at the facility. We also provide some general suggestions for implementing the JSCS at the Univar site.

Evidence that the Stormwater Pathway may be a Complete Pathway for Contamination to Migrate to the Willamette River

Available information indicates that stormwater from the site is a complete pathway for contamination to reach the Willamette River including the following:

- Univar USA is a chemical storage, packaging, and distribution company that handles a wide variety of chemicals that are hazardous to human health and the environment. There are numerous records of chemical spills documented by the Fire Marshal records and written communications with BES. Some of these documented spills and releases reached the stormwater conveyance system.
- Ninety percent of the site is covered by buildings or paved surfaces suggesting most of the precipitation that enters the site leaves as stormwater which discharges to the City's stormwater conveyance system and to the Willamette River. There are five general stormwater drainage areas on the site, three of which are located in active facility operational areas including:
  - A main stormwater collection area that services the southern portion of the site, which includes half of the rail spur, a drum fill area, solvent tank farm and the groundwater treatment operations,
  - A stormwater collectionarea near the corrosive tank farm and central rail spur, and
  - A stormwater collection area including the southeastern corner of the loading dock and covered drum storage area.
- In 1996, at the request of BES, Univar conducted a solids cleanout from the City's 42-inch stormwater conveyance line east of the facility into which the facility's stormwater drains. The cleanout resulted in the removal of 15-20 cubic yards of sludge with elevated concentrations of VOCs. Based on our review of available information, it appears that the sludge was not analyzed for any of the chemicals stored, packaged or distributed from the facility other than VOCs.
- Analytical data from self monitoring and City monitoring of the wastewater discharge under the BES Industrial Wastewater Discharge permit #400.025 indicates that copper, lead, zinc, chlorinated solvents, and phthalates are present in the facility's waste streams at concentrations above DEQ's and EPA's JSCS screening values. Although these contaminants were detected in discharge water that goes to the sanitary sewer system, it confirms that these contaminants are present at the site and therefore may be present in stormwater discharged from the facility.
- In-river sediment data from near Outfall 18 suggests that within Basin 18 there are sources of the following chemicals: lead, mercury, phthalates, PAHs, PCBs, and DDT metabolites. The Univar facility is located within Basin 18.
- BES conducted in-line solids sampling from within the 42-inch stormwater conveyance line, accessed from manhole AAT557, just down pipe from the Univar facility. The solids sample contained elevated metals (copper, cadmium, chromium, and lead), PCBs, DDTs, chlordane, selected PAHs, and motor oil.

Based upon the information presented above, a wide range of hazardous substances have been released at the Univar facility, and these releases have historically included offsite migration of contaminants through the site's and City's stormwater conveyance systems.

In addition to stormwater runoff from the facility being a potential source of contamination to the Willamette River via the stormwater pathway, there is also evidence that contaminated groundwater from beneath the facility enters the City's 42-inch stormwater conveyance line to the east and north of the facility and migrates to the Willamette via the stormwater pathway. Video surveys of the 42-inch stormwater line in 1996 (Sylvester, 1996) showed staining at some joints and a leaking joint indicating that groundwater enters the line. As a part of the DEQ Cleanup site investigation for Container Recovery (located immediately east of the Univar facility), DEQ requested that Container Recovery investigate whether groundwater from beneath their site enters the 42-inch stormwater conveyance line located between the two sites. The investigation showed that the northern portion of the 42-inch stormwater conveyance line west of Container Recovery (east of Univar) lies below the shallow water table for at least part of the year. There is another 42-inch stormwater conveyance line to the north (downgradient) of the Univar facility that is at a lower elevation than this east 42-inch stormwater conveyance line, suggesting that it is also probable that this line is also below the shallow water table seasonally. Thus, the 1996 video survey coupled with the groundwater versus pipe elevation study conducted for Container Recovery indicates that groundwater from beneath the Univar Facility enters the stormwater pipe and migrates to the Willamette River.

Stormwater Pathway Investigation Suggestions

BES requests that EPA require Univar USA, Inc to conduct an investigation of the stormwater pathway in accordance with the JSCS, including Appendix D. There is already sufficient information on the site history, potential sources, current stormwater controls and NPDES monitoring results. The stormwater pathway investigation should include the following general components:

- Investigate stormwater from the whole facility for a complete suite of constituents including not only those readily identified in Univar's operations but also those found in the solids from the conveyance system, within in-river sediments near Outfall 18, and Harbor-wide pollutants of concern. At a minimum this list includes metals, VOCs, SVOCs, phthalates, PCBs, pesticides, TPH, and total organic carbon. To date, the NPDES permit has only required sampling of a few constituents related to stormwater (copper, lead, zinc, pH, total suspended solids, oil and grease, as specified by the 1200Z general industrial permit) and to the treated groundwater discharge constituents (select VOCs and cyanide). The analyte list required by the NPDES permit lacks many of the constituents identified down pipe from the facility and those stored, packaged, and distributed at the facility.
- Gain a thorough understanding of the site's stormwater system (drainage basins, collections system, lines, discharge points, etc.).
- Sample catch basin solids and screen against JSCS Screening Level Values (SLVs). Catch basin solids should be analyzed for grain size in addition to the constituents

listed above. BES "Guidance for Sampling Catch Basin Solids" (JSCS Attachment C of Appendix D) should be followed for sampling. Sampling should be conducted at the beginning of the water year and more times if variability in the catch basin solids is expected. Based on the file review, it appears that no catch basin sampling has been conducted.

- Collect whole water stormwater samples and screen against JSCS SLVs. Sampling should include a minimum of 4 storm events per water year, and sampling locations should represent all stormwater discharges from the facility.
- Plot groundwater elevations relative to the elevation of the stormwater pipes both on the facility and the City's stormwater conveyance pipe around the facility to understand where groundwater could potentially enter the stormwater system. During periods of high shallow groundwater elevations, the stormwater system should be investigated through video or other means for evidence of groundwater entering the stormwater system. If evidence of groundwater entering the system is observed, samples of the water entering the system should be collected and analyzed for the entire suite of constituents listed above.
- The RCRA Corrective Action Remedy will not be complete until it addresses results of the stormwater pathway investigation to prevent migration of contaminants to the Willamette.

BES is concerned that without a complete investigation consistent with the JSCS, the remedy for the site may not address the stormwater pathway at the facility. Because of the location of the site within the Portland Harbor Superfund Study Area and the significant indications of releases to stormwater, it is critical that the stormwater pathway be fully investigated.

We hope we have supplied sufficient information to justify additional investigation of the stormwater pathway prior to selecting the final remedy for the site. Please contact me at 503-823-7263 if you have any questions or need additional information.

Sincerely,

Dawn Sanders
City of Portland Project Manager
Superfund Program

c: Jim Anderson/DEQ
Bruce Gillis/DEQ
Bruce Brody-Heine/GSI

APPENDIX B

APPENDIX B

CATCH BASIN SAMPLING SOP

Standard Operating Procedures

Guidance for Sampling of Catch Basin Solids

Prepared for

City of Portland

July 2003

Prepared by

CH2MHILL

VERSION 1.0
PDX/031550010.DOC

Printed on Recycled and Recyclable Paper

Contents

Standard Operating Procedures—Guidance for Sampling of Catch Basin Solids

1.0 Purpose

This document describes Standard Operating Procedures (SOPs) for the collection of environmental solids samples from stormwater catch basins. It provides procedures to be used for assessing potential pathways of contamination from upland sources via stormwater conveyances to receiving waters and sediments. Sampling for environmental investigations requires different methods than those that may be used for determining waste profiles for catch basin solids disposal.

The procedures described here are intended to provide representative samples of catch basin contents. These procedures may be modified for other purposes, such as assessing characteristics of older or newer solids, or because of space or access limitations. All deviations from these SOPs should be noted in field logs and reports.

1.1 Background

Catch basins are typically designed to prevent debris, gravels, and soils from fouling storm drain lines, and generally remove larger particles (greater than approximately 1 millimeter in diameter). Unlike specially designed stormwater treatment vaults, catch basins are not intended to remove fine particles or soluble pollutants, and they may only marginally reduce concentrations of contaminants or suspended solids. Catch basin retention efficiencies for suspended solids may be highly variable as functions of basin design, stormwater flow rates, accumulated solids in the sump (a function of cleaning frequency), and solids particle characteristics. Finer particle fractions may be suspended in moving water and carried beyond the catch basin. Because these finer particles are often correlated with organic and inorganic contaminants, special care needs to be taken while collecting catch basin solids samples to ensure that the finer particle fraction is sampled.

2.0 Scope and Applicability

The methodologies discussed in these SOPs are intended to provide procedures for collecting representative environmental samples of solids in stormwater catch basins. These SOPs describe specific steps that can be used to ensure representative and comparable data.

Residual material in catch basins is inherently variable. Factors that can affect variability include the characteristics of catch basin structures, the sources of particles, water flow rates and stormwater quality, and the depth and pattern of accumulated solids. In addition, the characteristics of catch basin solids can vary from slurry-like to dry solids. Although variability may be unavoidable, standard methods of collecting and handling samples can improve data quality.

3.0 Equipment and Materials

The following equipment should be available for collecting solids samples from catch basins:

- Sampler (generally one type will be selected per catch basin)
  - Stainless steel scoop, trowel, or spoon
  - Bucket (hand) auger
  - Hand corer
  - Petite Ponar® dredge/Van Veen® dredge (0.025 square meter [m^2])
- Sampling Equipment List
  - Site Sampling and Analysis Plan and/or site files detailing sampling locations, sample collection, and site information
  - Large stainless steel bowl
  - Stainless steel mixing spoon
  - Latex gloves
  - Metal or wooden rod
  - Field data sheets or other documentation
  - Laboratory-supplied sample containers
  - Cooler and ice/chilled blue ice
  - Tape measure
  - Ziploc® bags
  - Field notebook
  - Permanent marking pens
  - Sample labels
  - Chain-of-custody seals
  - Personal Protective Equipment (PPE)

4.0 Procedures

4.1 Documentation

Regardless of the equipment to be used, the following general procedures apply:

- Confirm any active catch basin best management practices such as sweeping and cleaning, frequency of activity, etc., if known.
- Document design flow rates (base flow, storm flow) for catch basins, if known.
- Record weather conditions at the time of sampling and last known rainfall event(s).
- Record the location of the catch basin. Include potential solids or contaminant sources such as construction activities, erosion, equipment storage or use, waste or material storage, vehicles, exhaust vents, onsite processes, etc. Site features, distances, flow directions, and gradients should be noted or sketched on a site map.

- Record dimensions of catch basin. Diagram inlet/outlet pipes in the catch basin. The source of inlet flows and destination of outlet flows should be noted, if known.
- Note the presence of water, visible flows, signs of flooding, clogging, debris in or around the catch basin, blocked inlets/outlets, staining, etc.
- Note any apparent evidence of contamination in the catch basin, such as odor, sheen, discoloration, etc., of water or solids.
- Measure the depth of solids in the catch basin and the total depth of the catch basin or sump. Use a decontaminated metal rod or disposable wooden dowel to probe the total depth of the catch basin.
- When recovering samples, record visual observations of:
  - Color
  - Texture, estimates of particle size fractions (as soil classification)
  - Amount and type of debris (Note: any large debris observed in the sample, including sticks, leaves, beverage containers, miscellaneous pieces of plastic and metal, stones and gravel, etc., should be removed, but paint chips and small organic matter should be left in the sample)
- Prepare a diagram of sampling locations within the catch basin, noting any special features such as sumps, inlets and outlets, etc.
- Decontaminate all sampling equipment using documented procedures before and after any sampling activities. Record the decontamination procedures in the field notes.
- Record any deviations from the specified sampling procedures or any obstacles encountered.
- Complete a chain-of-custody form for all samples.

4.2 Selection of Sampling Method

Sampling equipment should be matched with the presence and depth of water, solids water content, and catch basin depth. Figure 1 presents a flow chart for determining the appropriate sampling device. Detailed descriptions of each sampling method are presented in Section 4.3.

4.2.1 Decontamination of Equipment

Non-disposable equipment that contacts solids samples should be thoroughly cleaned and decontaminated before each set of samples is collected. Decontamination should be done in accordance with City of Portland SOP 7.01a[1] or comparable standard. Decontamination solutions should be selected on the basis of the type of analysis being conducted on samples.

---

[1] Bureau of Environmental Services, Environmental Investigations Division, SOP No. 7.01a Draft or subsequent revisions, Decontamination of Sampling Equipment.

4.3 Sample Collection

This guidance for sampling catch basins is intended to assess individual catch basins as potential sources of past, present, or future conduits of contamination to Willamette River sediments. Sample collection should therefore incorporate material representative of the total depth and area unless specific alternative sampling objectives are otherwise noted and approved. In some cases, sample collection from discrete depths may be desired based on knowledge of catch basin maintenance and time since last cleaning, activities conducted within the drainage area, spills or releases, and related information.

Standing water in the catch basin, if present, may be pumped off to simplify sample collection. If this procedure is conducted, care must be taken to:

- Pump water from the surface only
- Leave a thin layer of water so that fine materials in the solids are not disturbed
- Pump water slowly so that fine materials are not disturbed
- Dispose of pumped water in the sanitary sewer (pumped water may not be released into the storm system)
- Document all steps taken, the depth and volume of water removed, the point of water disposal, water remaining before sampling, and other relevant factors

4.3.1 Sampling Firm Solids in Catch Basins Without Standing Water

Firm solids above the water line are most easily collected using simple soil sampling tools (that is, stainless steel spoon or trowel, or bucket auger). When sampling with a spoon or auger, solids may be moist or wet but should retain their form and structure when handled. (Note: If the sample has a high water content [water drips from solids], another sampling method should be considered to minimize the loss of fine particles in liquid drainage.)

4.3.1.1 Stainless Steel Spoon, Scoop, or Trowel

If necessary, the spoon, scoop, or trowel may be attached to an extension pole in order to reach the bottom of the catch basin, provided a representative sample can be retained on the spoon and recovered intact.

The following procedure defines steps to be taken when sampling dry or moist solids with a stainless steel spoon, scoop, or trowel:

1. Collect the necessary equipment. Clean and decontaminate the equipment, using procedures appropriate for the analytical parameters to be measured.
2. Arrange the appropriate sampling containers.
3. Don a new pair of nitrile or latex gloves.
4. Using a decontaminated stainless steel spoon, scoop, or trowel, collect an equal amount of material from five locations: each corner (or, if round, each compass point) and the center. Material recovered at each point should be a composite of the total depth of accumulated material, unless otherwise specified in the sampling plan.

5. Place sampled solids into a decontaminated stainless steel bowl or tray. Repeat step 4 as necessary in order to obtain the required volume, and mix to homogenize thoroughly using a decontaminated or disposable stainless steel spoon.
6. Collect a suitable portion of the mixed solids with a decontaminated or disposable stainless steel spoon and place into each appropriate sample container.
7. Check that a Teflon® liner is present in caps, if required. Secure the caps tightly. Label sample containers clearly with all appropriate sample information.
8. Place samples in cooler for transport. Refrigeration to 4° Celsius (C) is usually required. Transport time to the laboratory should be as short as possible and must be documented with a chain-of-custody form.
9. Ensure that appropriate field notes, as detailed in the Field Documentation, Section 4.1, have been collected.
10. Complete the chain-of-custody documents.

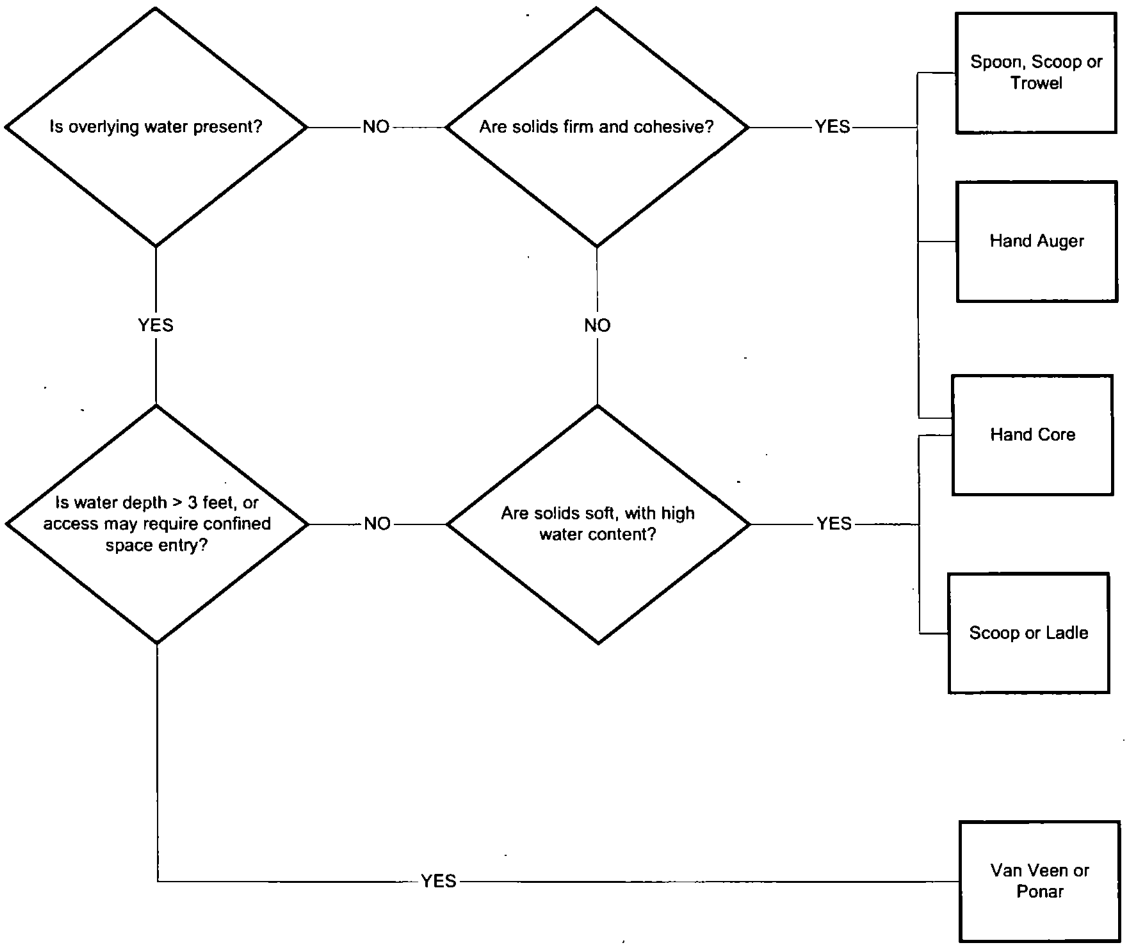
4.3.1.2 Stainless Steel Bucket Auger (Hand Auger)

Bucket augers are applicable to the same situations and materials as the spoon, scoop, and trowel method described above. Most bucket augers have long handles (> 4 feet), and some can be fitted with extension handles that will allow the collection of solids from deeper catch basins.

The following procedure defines steps to be taken when sampling dry or moist solids with a stainless steel bucket auger:

1. Collect the necessary equipment. Clean and decontaminate the equipment, using procedures appropriate for the analytical parameters to be measured.
2. Arrange the appropriate sampling containers.
3. Don a new pair of nitrile or latex gloves.
4. Advance a thoroughly cleaned and decontaminated bucket auger into catch basin solids in each corner (or, if round, each compass point) and the center of the catch basin. Material recovered at each point should be a composite of the total depth of accumulated material, unless otherwise specified in the sampling plan.
5. Empty the auger into a stainless steel bowl or tray. Repeat step 4 as necessary in order to obtain the required volume and mix to homogenize thoroughly, using a decontaminated or disposable stainless steel spoon.
6. Collect a suitable portion of the mixed solids with a decontaminated or disposable stainless steel spoon and place the sample into each appropriate sample container.

Figure 1. Flow Chart for Selecting the Appropriate Catch Basin Solids Sampler



7. Check that a Teflon® liner is present in caps, if required. Secure the caps tightly. Label sample containers clearly with all appropriate sample information.
8. Place samples in cooler for transport. Refrigeration to 4° Celsius (C) is usually required. Transport time to the laboratory should be as short as possible and must be documented with a chain-of-custody form.
9. Ensure that appropriate field notes, as detailed in the Field Documentation, Section 4.1, have been collected.
10. Complete the chain-of-custody documents.

4.3.2 Sampling Solids in Catch Basins with Standing Water

Hand corers or dredge samplers should be used when standing water is present in catch basins to prevent washout of sample material when the sampler is retrieved through the water column. Corers may also be used for dry and moist solids. Some hand corers can be fitted with extension handles that will allow the collection of samples in deeper basins.

4.3.2.1 Hand Corers

The following procedure defines steps to be taken when sampling saturated solids with a stainless steel hand corer:

1. Collect the necessary equipment. Clean and decontaminate the equipment, using procedures appropriate for the analytical parameters to be measured.
2. Arrange the appropriate sampling containers.
3. Don a new pair of nitrile or latex gloves.
4. Using a thoroughly cleaned and decontaminated corer, advance the sampler into catch basin solids with a smooth, continuous motion, twist corer, and then withdraw it in a single motion.
5. Remove the nosepiece and withdraw the sample into a stainless steel bowl or tray.
6. Repeat steps 4 and 5 in each corner (or, if round, each compass point) and the center of the catch basin. Material recovered at each point should be a composite of the total depth of accumulated material, unless otherwise specified in the sampling plan.
7. Mix to homogenize thoroughly, using a decontaminated or disposable stainless steel spoon.
8. Collect a suitable portion of the mixed solids with the decontaminated or disposable stainless steel spoon and place into each appropriate sample container.
9. Check that a Teflon® liner is present in caps, if required. Secure the caps tightly. Label sample containers clearly with all appropriate sample information.
10. Place samples in cooler for transport. Refrigeration to 4° Celsius (C) is usually required. Transport time to the laboratory should be as short as possible and must be documented with a chain-of-custody form.

11. Ensure that appropriate field notes, as detailed in the Field Documentation, Section 4.1, have been collected.

12. Complete the chain-of-custody documents.

4.3.2.2 Clamshell-Type Dredge Samplers

Clamshell-type dredge samplers like the Petite Poner® and Van Veen® 0.025-m^2 dredge sampler are capable of sampling moist and wet solids, including those below standing water. However, penetration depths usually will not exceed several inches, so it may not be possible to collect a representative sample if the solids layer is greater than several inches. The sampling action of these devices causes agitation currents that may temporarily resuspend some settled solids. This disturbance can be minimized by lowering the sampler slowly and by allowing slow contact with the solids.

Samples collected with clamshell-type dredge samplers should meet the following acceptability criteria in order to ensure that representative samples have been collected (EPA, 2001):

- Solids do not extrude from the upper surface of the sampler.
- Overlying water is present in the sampler (indicating minimal leakage).
- Overlying water is clear and not excessively turbid.
- Desired depth of penetration has been achieved.
- The solids-water interface is intact and relatively flat, with no sign of channeling or sample washout.
- There is no evidence of sample loss.

The following procedure defines steps to be taken when sampling moist, wet, or submerged solids with a dredge sampler:

1. Collect the necessary equipment. Clean and decontaminate the equipment, using procedures appropriate for the analytical parameters to be measured.

2. Arrange the appropriate sampling containers.

3. Don a new pair of nitrile or latex gloves.

4. Using a thoroughly cleaned and decontaminated dredge-type sampler and working on a clean, decontaminated surface, arrange the sampler in the open position, setting the trip bar so that the sampler remains open when lifted from the top.

5. Slowly lower the sampler to a point just above the solids surface.

6. Drop the sampler sharply into the solids, then pull sharply on the line, thus releasing the trip bar and closing the dredge.

7. Raise the sampler and place on a clean surface. Slowly decant or siphon any free liquid through the top of the sampler. Take care to ensure that fines are not lost in the process; if necessary, allow the sampler to sit and the fine particles to settle before decanting or siphoning free liquid.

8. Open the dredge and transfer the solids into a large stainless steel bowl or tray of sufficient size to receive three sample loads.
9. Repeat steps 4 through 8 in diagonal corners (or, if round, two opposite compass points) and the center of the catch basin. Material recovered at each point should be representative of the total depth of solids in the sampling device. If necessary, modify sampling points to correspond to catch basin size or dimensions. Record any deviations in the field notes.
10. Mix to homogenize thoroughly, using a decontaminated or disposable stainless steel spoon.
11. Collect a suitable portion of the mixed solids with a decontaminated or disposable stainless steel spoon and place into each appropriate sample container.
12. Check that a Teflon® liner is present in caps, if required. Secure the caps tightly. Label sample containers clearly with all appropriate sample information.
13. Place samples in cooler for transport. Refrigeration to 4° Celsius (C) is usually required. Transport time to the laboratory should be as short as possible and must be documented with a chain-of-custody form.
14. Ensure that appropriate field notes, as detailed in the Field Documentation, Section 4.1, have been collected.
15. Complete the chain-of-custody documents.

5.0 Sample Acceptability

Only solids that are collected correctly with grab or core sampling devices should be used for subsequent physicochemical testing. Acceptability of grabs can be ascertained by noting that the samplers are closed when retrieved, are relatively full of solids (but not overfilled), and do not appear to have lost surficial fines. Core samples are acceptable if the core was inserted vertically in the solids and an adequate depth was sampled without significant loss out the mouth of the corer.

6.0 Quality Assurance and Quality Control

A rinsate sample may be appropriate or required when non-disposable sampling equipment is used. The equipment rinsate should be collected between sampling locations and after the device has been decontaminated. The rinsate sample should be analyzed for the same parameters analyzed for in solids.

7.0 Resources

1. ASTM. September 1994. Standard Guide for Collection, Storage, Characterization, and Manipulation of Sediment for Toxicological Testing. American Society for Testing and Materials (E 1391-94). West Conshohocken, Pennsylvania.

2. EPA. 1987. A Compendium of Superfund Field Operations Methods, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response (EPA/540/P-87/001), Washington, D.C.

3. EPA. 2001. Methods for Collection, Storage, and Manipulation of Sediment for Chemical and Toxicological Analyses: Technical Manual. U.S. Environmental Protection Agency, Office of Water (EPA-823-B-01-002). Washington, D.C. October 2001.

APPENDIX C

APPENDIX C

STORMWATER SAMPLING REFERENCE

How To Do Stormwater Sampling
A guide for industrial facilities

Washington State
Department of Ecology

December 2002 (rev. 1/05)
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WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

Table of Contents

Introduction

The purpose of this guide is to help those who operate facilities do their own sampling.

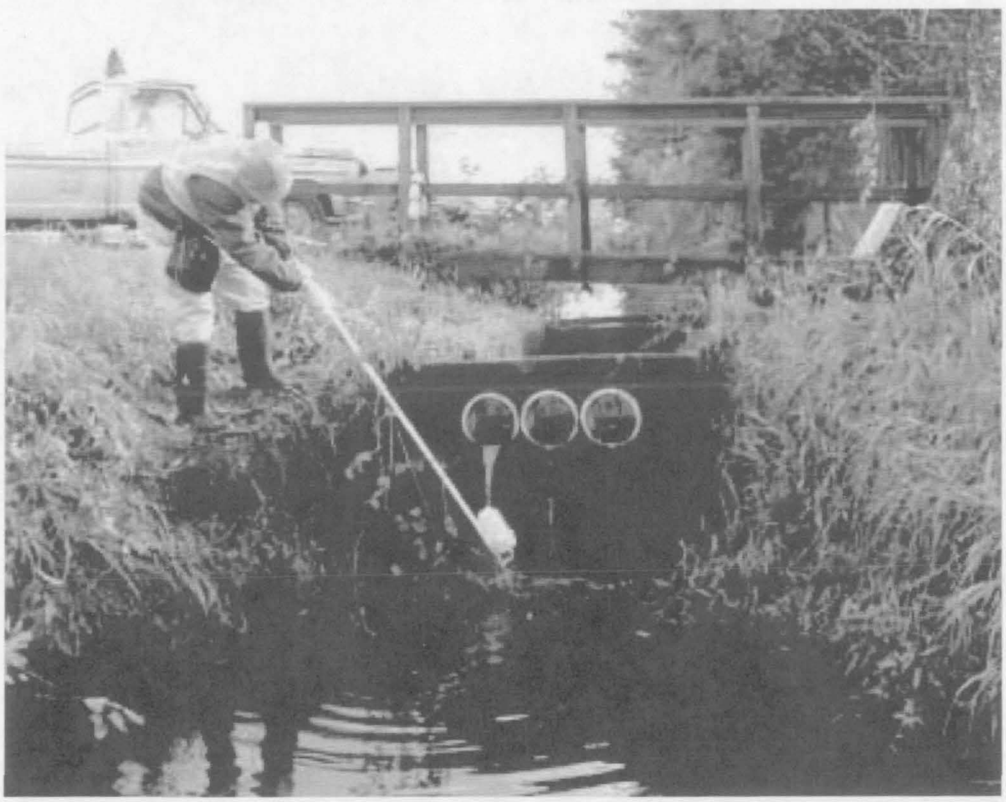
The *Industrial Stormwater General Permit* requires that your facility conduct at least quarterly visual monitoring and sampling of stormwater and report the sampling results to Ecology. These requirements are outlined in the permit under *Section S4. MONITORING REQUIREMENTS*. This guide supports the sampling portion of the general permit but does not substitute for it.

The purpose of this guide is to help those who operate facilities do their own sampling by more fully describing the steps and procedures to be followed. This guidance will lead you to be able to sample in a way that will provide you and Ecology with meaningful results.

Sources of pollutants that may enter surface water, sediments, or ground water can be identified by sampling stormwater discharges. The results of sampling will be helpful when developing your Stormwater Pollution Prevention Plan (SWPPP), determining if your existing plan is adequate, and when implementing or assessing Best Management Practices (BMPs).

Some effort is required up front to prepare for sampling in a way that will meet requirements and provide useful data. What follows is a step-by-step procedure of what you need to do to gather and report data that will represent the quality of stormwater leaving your facility. The steps are organized to guide you through the process from start to finish of stormwater sampling.

This guidance is an update to "How to do Stormwater Sampling" which was originally developed by Ecology's Environmental Assessment Program in 2002. The update was made in accordance with the modified The Industrial Stormwater General Permit which became effective in January 2005.



Advance Planning for Stormwater Sampling

Deciding What To Sample

Before beginning your sampling, you'll need to determine the specific pollutants (water quality parameters) you are required to sample and test for. Ecology has listed these parameters on your permit cover sheet. Your parameters are based on:

◆ the standard set of parameters for all facilities,

◆ your facility's primary Standard Industrial Code (SIC Code),

◆ whether your facility discharges to an impaired (303 (d) listed) water body, and

◆ any requirements that apply to water cleanup plans (TMDLs).

All facilities must monitor for turbidity, pH, zinc, and oil and grease. Oil and grease are grouped together as a single parameter tested in the lab with a single analysis. Turbidity can be measured directly in the field using a handheld meter, or sampled and analyzed in the lab. pH must be measured in the field using either a calibrated pH meter or pH paper. You can get pH paper from a distributor of scientific/laboratory supplies or through the same laboratory that will be doing your sample analysis. Zinc, oil and grease and other parameters required by the permit (other than turbidity and pH) are measured by sending bottled samples to a laboratory for analysis.

Selecting a Laboratory to Test Your Sample

Having identified the parameters you will need tested, the next step is to select a laboratory to perform the tests. You are required to select a lab accredited by Ecology. Accreditation assures Ecology that the lab is able to do quality testing using the analytical methods specified under Monitoring Requirements in your permit. A list of labs can be found on Ecology's website: www.ecy.wa.gov/programs/eap/labs/lablist.htm.

Contacting the Lab in Advance

You should contact the lab well ahead of time. They will be providing you with the sampling bottles you'll need. For some water quality parameters, such as oil and grease, it is not only desirable but necessary to collect the sample directly into a specially-cleaned container, so you will need to have bottles from the lab on hand before you sample. You can also ask your lab to send pH paper along with your sample bottles.

Discuss with the lab the analytical methods they will use, as specified in the sample parameter tables included in S4. D of the general permit. The lab will provide you helpful information and explanations that go beyond the scope of this guide. If you must meet discharge limits listed in S3, Discharge Limitations, you should carefully review them with the lab.

All facilities must monitor for turbidity, pH, zinc, and oil and grease.

Contact the lab well ahead of time.

Issues you may want to cover with the lab include:

The type and size of bottle that will be supplied for each water quality parameter to be sampled and tested.

How full to fill the bottle.

Any safety concerns with materials supplied by the lab.

Ask questions - your lab can help you.

What you need to know about preserving your samples: Make a note of the parameters for which bottles will have preservative inside. For some tests, a preservative is necessary. The preservative is a substance that stabilizes certain chemicals at the time of sampling so that a valid test can be done later. It is critical that you use the correct bottles because tests requiring preservative will not be valid without the correct preservative. In some cases, the wrong preservative will interfere with a test. It is important not to lose the preservative that comes in the bottles supplied by the lab.

The kind of labels the lab will supply for the bottles and how the labels should be filled out. The labels or tags you use to identify the samples you take must be waterproof, and if you write on them, the writing must be waterproof also.

Typical Sampling Information

Parameter	Bottle Type	Minimum Sample Required	Holding Time	Preservation
Turbidity	500 mL wide-mouthed poly	100 mL	48 hours	Cool to 4° C
Total Zinc	1liter (L) bottle cleaned according to protocol	500 mL	6 months	HNO_3 to pH<2 Cool to 4° C
Oil and Grease	1L glass jar	750 mL (jar ¾ full)	28 days Jar preserved in lab within 24 hours of arrival to lab.	HCl to pH<2 Cool to 4° C

A description of forms or other paperwork to submit to the lab with the samples and how to fill them out.

Whether the lab will supply pH paper as well as sample bottles, tags or labels for the bottles, and blank forms.

How bottles and other supplies from the lab will be delivered to you.

The holding times for each water quality parameter to be sampled and tested. A holding time is the maximum time allowed between taking the sample and doing the lab analysis. If you exceed holding time, the sample analysis is not acceptable.

How and when you will deliver samples to the lab. Plan with the lab how you will get the samples to them in time to begin analysis before the parameter with the shortest holding time reaches that holding time. The fastest way to deliver samples to the lab may be to do so in person, but it may be possible to ship samples (cooled in picnic coolers) and still meet holding times. If you deliver samples in person, you can pick up bottles and supplies for the next quarter at the same time.

The table (left) shows typical sampling information for the three water quality parameters that must be monitored under the Industrial Stormwater General Permit. The information you obtain from your lab may differ somewhat from this:

In many cases, the preservatives listed above come pre-measured in the sampling bottles and there is no need to check pH. Ask your lab about this.

Sampling requirements tend to use scientific words and units of measure. Temperature is measured in degrees Celsius, "C". Thermometers that we typically use in the United States measure temperature in Fahrenheit, "F" and 4° C is about 39° F. But for your purposes, "Cooling to 4° C" means putting the samples on crushed ice or packed with blue ice in an ice chest so they will be kept just above freezing. Metric units are used to measure weight, volume and distance. Liquid volumes do not use "quarts" and "cups" but use measures such as liters, "L" and milliliters "mL". Chemicals use their own scientific notation. Nitric acid for example is HNO_3. Be sure to have the lab explain any words or expressions that you do not understand.

Deciding How You Will Take The Sample

Section S4.A.1 of the Industrial Stormwater General Permit states that a grab, time-proportionate, or flow proportionate sample may be taken. A grab sample is a single sample "grabbed" by filling up a container, either by hand or with the container attached to a pole. It is the simplest type of sample to collect and it is expected that most Permit holders will choose to collect grab samples. The general permit recommends that grab samples be collected within the first hour after stormwater discharge begins.

As we will discuss in the next section, oil and grease samples *must* be collected as grab samples. Some Permit holders may choose to better represent water quality parameters other than oil and grease by collecting time-proportionate or flow-proportionate samples. These samples consist of a number of subsamples taken at intervals rather than a single grab sample. The general permit recommends that time-proportionate and flow-proportionate samples be started within the first 30 minutes after discharge begins, and be taken over a two-hour period.

A time-proportionate sample is one made up of a number of small samples (subsamples) of equal volume collected at regular time intervals combined into a single large sample. A flow-proportionate sample is one made up of a number of subsamples where each subsample is collected in such a way as to represent a given amount of stormwater discharge. Time-proportionate and flow-proportionate samples provide the advantage of including a number of smaller samples (subsamples) in the sample so that the stormwater discharge is better represented than with a grab sample. Time-proportionate and flow proportionate samples can be collected either by hand or with automated equipment. Collecting them by hand is somewhat difficult and collecting them with automated equipment involves additional expenses. Additionally, flow-proportionate sampling requires some knowledge of how to measure fluid flow. A reference for automatic stormwater sampling is the book *Automatic Stormwater Sampling Made Easy* (Thrush and De Leon, 1993) published by the Water Environment Federation. It can be purchased at *www.wef.org.*

Collecting Oil and Grease Samples

The general permit requires that oil and grease samples be collected by all permit holders. Because of the particular way oil and grease samples must be collected, this requirement may govern your overall approach to sampling.

For some parameters other than oil and grease, it is possible to sample in difficult situations by filling a container and transferring it to the sample bottle to be sent to the lab. Oil and grease samples, however, must be collected from the stormwater source directly. The sample cannot be transferred from another container because oil and grease tends to stick to the inside surfaces of containers. Since you must sample directly into the oil and grease bottle (grab sample), taking grab samples may be the easiest way to collect additional samples for the other parameters. Take samples by collecting stormwater directly from the discharge into the bottles supplied by the lab, filling each bottle one after another.

Oil and grease samples must be collected directly into the bottle you send to the lab.

Because oil and grease samples cannot be transferred between containers, a sample cannot be formed from separate grab samples combined together. If more than one oil and grease sample is desired from a sampling site during a storm event, additional oil and grease grab samples must be collected and analyzed separately.

Because oil and grease samples must be collected directly and not through the tubing of an automatic sampler, those using automatic samplers will still have to grab oil and grease samples by hand.

Determining which Discharges to Sample

The first step in selecting sampling points is to consider the areas draining your facility. The site map in your SWPPP should show the drainage areas. Areas of particular concern are those where raw materials or finished product are exposed to rainfall and/or runoff, and areas where leaking fluids such as petroleum products and hydraulic fluids have the potential to enter stormwater runoff.

The next step is to determine where the runoff from each drainage area is discharged from your facility. If there are separate drainage areas with separate discharge points, stormwater sampled at one discharge sampling point may not represent the facility's stormwater quality overall.

Section S4.A.5 of the Industrial Stormwater General Permit describes the requirements for selecting sampling points:

"Sampling must be conducted to capture stormwater with the greatest exposure to significant sources of pollution. Each distinct point of discharge offsite must be sampled and analyzed separately if activities and site conditions that may pollute the stormwater are likely to result in discharges that will significantly vary in the concentration or type of pollutants. Where pollutant types do not vary, the Permittee may sample only the discharge point with the highest concentration of pollutants. However, the SWPPP must include documentation on how these determinations were made and in the description of each point of discharge, including the relative quantity (volume) of discharge and pollutants likely to be found."

If your facility discharges stormwater collected over areas that are used for similar activities and have similar site conditions, and there is reason to believe pollutant types will be similar in such areas, a single sampling point can be used to represent several discharge points. For example, if a facility has separate discharge points but the industrial activities are similar, you can sample at just one of the discharge points. The site chosen must be the one where there is reason to believe the pollutant concentration is highest (the worst case). For example, select the discharge that drains an area with greater use and/or more equipment activity. Determining where to sample can be approached as a logical deduction, or you may want to take samples at multiple sites and use the results to determine sampling location. Documentation of how sampling sites were chosen is required in the SWPPP, as described above in the general permit.

If your facility has multiple discharge points from areas with different uses or activities, you need to determine if that will result in significant differences in the type of pollutants that may be discharged. For example, if one portion of the site is used to store raw materials and discharges separately from another portion of the site where finished product is stored, it may be necessary to take separate samples. Some initial sampling and analysis may be necessary to make this determination. Ecology expects that most facilities will be able to choose a single sample location for their site.

Making a determination of whether a discharge is likely to have stormwater quality that differs from other discharges and require separate sampling requires a review of the site map in the SWPPP with consideration to sources of pollutants in each drainage area. This should be followed up with an on site assessment of activities, sources and quantities of pollutants in each drainage area. This information will help you document your decision as to whether two or more drainage areas can be represented by a single sample site.

Selecting Sampling Points

◆ Pipes discharging your facility's stormwater offsite.

◆ Ditches carrying your facility's stormwater offsite.

◆ Manhole access to storm sewer's carrying your facility's stormwater, so you can lower a sample bottle attached to a pole into the manhole. In general, manhole access on your property may be simpler and safer than access off property and more readily verifiable as carrying only your facility's stormwater.

These three types of sampling points are not too difficult to access and the flow within them tends to be fast enough, with enough turbulence, to allow you to collect well mixed, representative samples. In some cases, portions of industrial stormwater runoff leave a site as sheet flow. Specific approaches to sampling of pipes, ditches, manholes, grated storm drains, and sheet flow will be covered in the final section of this guide manual.

Make sure your sampling points will provide for sampling only the stormwater that comes from your facility. If the stormwater in a pipe (storm sewer) contains other discharges, move your sampling point upstream to a point where the flow is from your facility only. Also check to see that there is no base flow in the storm sewer during dry periods. Report in your SWPPP the presence of any base flow and measure or estimate its flow rate. If it is not possible to sample only flow from your facility, document the reason for this and provide information concerning the source of the flow you are sampling.

If possible, the stormwater your facility samples should not be a mixture of your facility's stormwater with other water. Some examples of situations where a sample would be of a mixture of water sources, situations in which you should **not** sample:

Examples of mixed water sources situations in which you should not sample:

A ditch that carries additional stormwater from properties upstream. In this case, the stormwater from your facility is mixed with other water and you should find a location or locations where your facility's stormwater alone can be sampled.

A stormwater sewer or pipe (culvert) discharges to a creek or other receiving water, the pipe being partially submerged where it discharges into the receiving water. In this case, this final discharge point will not be able to be used as a sampling point because the stormwater flow is mixed with the receiving water.

A manhole that carries stormwater, not only from your facility but from other stormwater sources as well. If you are grabbing a sample from a manhole but from the point where a storm sewer from your facility ends at a municipal manhole, make sure that the flow in that pipe is entirely from your facility, that the pipe is not submerged or partly submerged and that you are otherwise not prevented from collecting stormwater from your facility only. If you are not sure that a storm sewer carries only flow from your facility, the municipality may

Base flow here refers to any water in the ditch that is not a direct result of stormwater runoff. Ground water seepage into the ditch, for example, would add base flow.

Manhole access can be a good sample point if it can be accessed safely and the stormwater is solely from your facility. Do not climb into the manhole. Use a sample bottle attached to a pole to take the sample.

Practice sampling before you do the real thing.

Take time to get ready for sampling.

have storm sewer plans to help you determine this. Contact the municipality beforehand to discuss sampling from the manhole and associated safety issues, particularly for manholes in areas with vehicular traffic.

It is important to sample flow from only your facility if possible because otherwise it cannot be determined what the sample actually represents. If you discharge stormwater to a stormwater conveyance system that includes stormwater from other sources, you need to sample before your stormwater commingles with stormwater from other sources. However, if stormwater runs onto your property in an uncontrolled fashion (for example, sheet flow) from adjacent property, into areas of industrial activity on your site so that it becomes a part of the stormwater discharge from your site, this should be included in your sample of stormwater discharge. If you are concerned about this offsite source, you may want to sample that stormwater where it enters your property. If the results show significant pollution, you may want to provide Ecology with a narrative description of the contributing site and sample results to document the relative contribution of the other property or upstream source.

It is a good idea to observe the sampling point(s) you have chosen during actual stormwater runoff conditions to see how readily stormwater can be sampled there. Keep in mind that changing tides and flow conditions in receiving waters, including flood stages may occur during storm events. This may cause a pipe that is discharging your facility's stormwater to become submerged or partly submerged, preventing you from sampling during some conditions.

Obtaining Supplies for Sampling

The supplies you will want to have on hand before sampling include:

◆ Sampling bottles from the lab, including a few extra of each type.

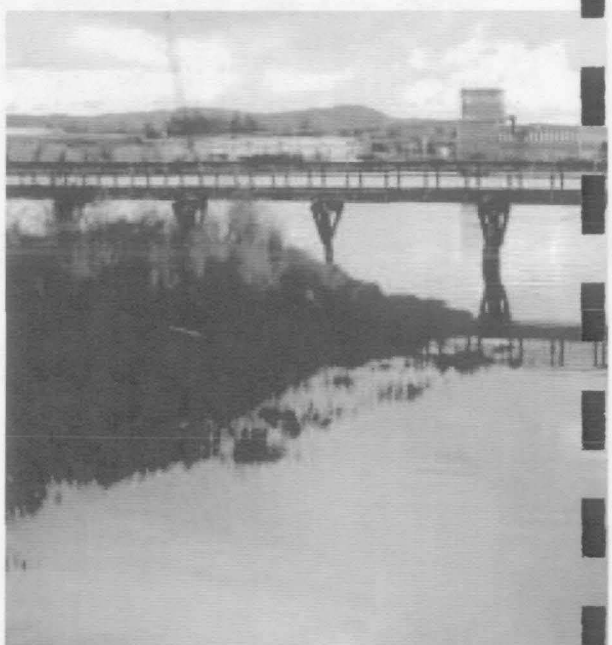
◆ When needed, a pole to hold sample bottles and filament strapping tape.

◆ Powder-free disposable nitrile or latex gloves (sold by medical and laboratory suppliers). Do not use powdered gloves as the powder may contain metals that could contaminate metals samples such as zinc.

◆ Foul-weather gear.

◆ One or more picnic coolers (depending on the number of samples to be stored and transported or shipped).

◆ A bound notebook to serve as a field book for keeping records concerning sampling. Notebooks with waterproof pages are available for these field notes at office supply stores. The information to be included in the notes will be described in the "Keeping Records" section of this guide.

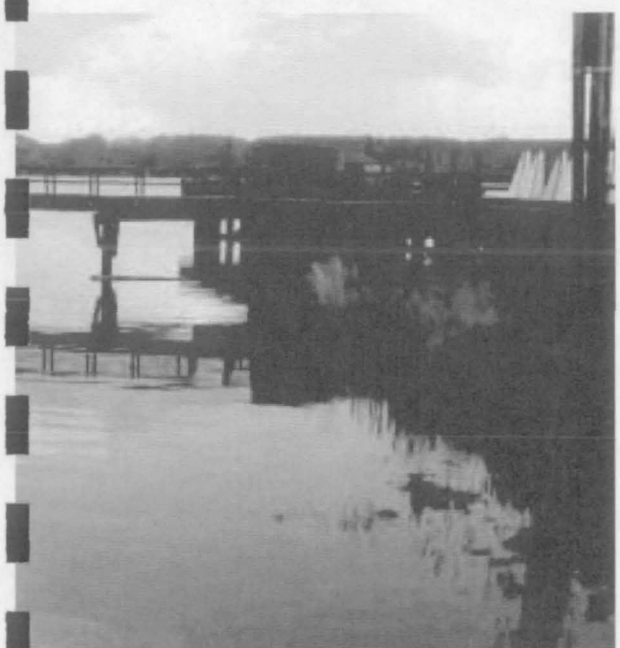


Planning Just Prior to Stormwater Sampling

Now that the bulk of the planning for sampling is complete, there are a few things to keep in mind before deciding to actually begin sampling.

Being Prepared

It is important to assemble everything that will be needed for the sampling event ahead of time because opportunities to sample during storm events often come with little advanced notice. Complete the identification tags and Lab Services Required form. Place the tags, lab form, field notebook, permanent ink pen, meter, and pH paper in the cooler with the sample bottles. Have re-sealable plastic bags or other means on hand to keep the pH paper dry. If you are using a turbidity meter or pH meter, be prepared to protect them from the rain. Have foul-weather gear ready and available. It will be necessary to keep sufficient ice on-site or plan to purchase ice that day.



Choosing the Storm Event

Now you are ready to sample. Successful sampling is first and foremost a matter of being at the right storm event at the right time. What follows is some guidance on how to do that.

The general permit recommends that the storm event to be sampled must meet the following two conditions:

1. Be preceded by at least 24 hours of no greater than trace precipitation.

2. Have an intensity of at least 0.1 inches of rainfall (depth) of rain in a 24-hour period.

If the above criteria can't be met, the permittee must still collect and submit stormwater sampling results in accordance with the general permit. A permittee is required to sample only once in a sample collection period and use its best efforts to achieve the above recommended sample collection criteria. If a sample is taken and the recommended sample collection criteria are not met, the permittee is not required to conduct additional sampling for that sample collection period.

Success in collecting grab samples requires being ready to go as soon as the decision is made to sample during a particular storm event. It is especially important to be at-the-ready because the permit recommends that grab samples be collected during the first hour of stormwater discharge. Note that the permit recommends that the sample be taken within the first hour after discharge from your facility to a point off site, not from when rainfall begins.

You will increase your chances of meeting the second recommended criterion for rainfall intensity at a minimum of effort if you evaluate weather forecasts before deciding whether or not to sample a particular rain event.

Sample during a hard (intense) rain event.

Check weather forecasts.

If your facility is located in an area that is covered by a standing snow pack for days at a time during a year of normal precipitation, you may alternatively sample a snowmelt event during the winter or spring quarter. The recommended sampling conditions for a snowmelt event are as follows:

1. It is preceded by at least 24 hours of no greater than *trace* precipitation.

2. The snowmelt is generated by a rainfall or warm weather melt-producing event on a standing snow pack of at least one inch in depth.

3. The sample is collected during the first hour of discharge from your facility that was produced by the melting snow.

Keeping up with the weather forecast and planning so that sampling can be carried out on short notice are the keys to successful sampling.

Local forecasts, including televised satellite and radar images can give an indication of the expected intensity of coming storms. The National Weather Service is an excellent source of information on upcoming storms. It also includes local current radar and satellite images. Their website: *http://www.wrh.noaa.gov/seattle.* A number of commercial websites, such as *http://www.weather.com/* and *Yahoo* also provide weather information and forecasts.

When evaluating a weather forecast, consider indications of expected intensity, for example "90% chance" rather than "50% chance" and "rain" rather than "showers." Over the telephone, National Weather Service personnel can often provide estimates of anticipated rainfall amounts. In addition to intensity, consider the predicted duration of the storm. It will be very helpful to spend time observing rain events at your site with attention to how rain intensity relates to stormwater discharges from your site, before you begin sampling.

Once the decision has been made to attempt to sample a storm event, the personnel who will be sampling should be notified and they should prepare to sample. If it does rain, they should be at the sampling sites before stormwater begins discharging so they can document the time of discharge and be ready to sample.

Conducting Sampling at Your Facility

After you have selected a storm event and it begins raining, the personnel conducting the sampling should prepare their equipment and go to the sampling site(s). They will be collecting grab samples at the sampling site(s), placing the samples in picnic coolers containing ice, and keeping notes in a field book.

Sampling for the first time may require working out some difficulties, but after performing these duties once, future sampling will not be difficult.

Checklist for Sampling

Because stormwater sampling is not a daily part of the workload of a facility, it is a good idea to keep a checklist of things to have prepared before sampling and to do during sampling. You can make the checklist by jotting down the things you did for the first sampling event to remember for subsequent sampling events. Update this checklist, if necessary, based on the experience you gain with each sampling event.

How to Fill Sample Bottles

This section and an illustrated appendix at the end of this guide describe how to collect a sample properly. Collecting a grab sample can be as simple as holding a bottle under the stormwater falling from a pipe and filling the bottle properly. Still, the person doing the sampling must use care in applying the principles outlined below so that the sample will be representative of the water being sampled.

Simple principles of good grab sample collection:

Wear disposable powder-free gloves when sampling.

Grab samples with the stormwater entering directly into bottles supplied by your lab rather than by transferring the samples from a container that may not be clean. Metal contamination of ordinary containers is common and household detergents often contain phosphorus, a tested parameter for some industries. Again, transferring the sample from another container is not an option for oil and grease samples under any circumstances.

When holding the sample bottle your lab has provided, keep your hands away from the opening in order to prevent contaminating the sample.

Always hold the bottle with its opening facing upstream (into the flow of water) so that the water enters directly into the bottle and does not first flow over the bottle or your hands.

Sample where the water has a moderate flow and, if possible, some turbulence, so that the stormwater discharge will be well-mixed and the sample will be representative. Sampling in still water should be avoided. Include in your field book a note about the sample location and how briskly the water appears to be moving.

Sample from a central portion of the stormwater flow, avoiding touching the bottom of channels or pipes so as not to stir up solid particles.

Have your sampling kit ready to go.

Take notes! Writing down your observations at the time of sampling is importatnt.

Do not rinse or overfill the bottles. The bottles supplied by your lab for some parameters (ammonia and phosphorus) will include small amounts of liquid preservative (generally a few drops). Fill the bottle to about ½ inch of the top (not quite full) to ensure that no preservative is lost.

As soon as the sample is collected, cap the bottle and label it. It is important that the bottles are labeled correctly so that the lab will be able to identify samples by sample site and ensure proper preservation for each parameter. It is a good idea to place sample bottles in re-closable bags. Place the samples in a picnic cooler partially filled with ice. Plan to maintain ice in the picnic cooler until the samples arrive at the lab. Remember to make certain that the samples will be delivered to the lab soon enough for the lab to meet holding times.

Oil and grease sampling raises additional concerns:

Oil and grease floats on water so sampling it requires special attention. Oil and grease samples must be collected directly into the sample bottles supplied by the lab because oil and grease tends to stick to the sides of containers. Do not rinse the sampling bottles beforehand or pour the sample from another container. Do not fill the bottle completely and do not pour out some of the sample if the bottle is overfilled by mistake. If you do overfill a bottle, use a new bottle instead to collect your sample. Because you only get one try at filling an oil and grease bottle, it is a good idea to have plenty of extra bottles on hand.

Oil and grease samples should be collected as the stormwater falls from a pipe or from a running, turbulent stream of flow when possible so the source will be well mixed. When the samples must be collected from a water surface, the person holding the bottle should plunge it below the surface in a sweeping arc and then bring it upwards through the water surface again, so the water surface is broken twice by the mouth of the bottle. Be sure to note in your field book how you collected your samples as this is especially important for the oil and grease sample.

Keeping Records

Section S5. of the general permit specifies requirements for reporting and recordkeeping. In order to comply with the requirement that lab reports include sampling date and sampling location, you will need to supply this information to the lab when submitting samples. You can do this by using the sample location as the field station identification on your labels or sample tags.

You should purchase a notebook for use in the field. Water resistant "rite in the rain" notebooks serve the purpose well. Information is available at www.riteintherain.com.

Section S5.C. requires that you record the date, exact place, method, and time of sampling or measurement, and the individual who performed the sampling or measurement (the section also specifies some requirements for lab record keeping). Record these in your field book:

- ◆ Time rainfall began
- ◆ Sampling location (when there is more than one)
- ◆ Date of sampling
- ◆ Time of sampling (and time you completed sampling if different)
- ◆ How you collected the sample (for example, "from a ditch by hand" or "from a manhole with the bottles on a pole")
- ◆ name of the sampler(s)
- ◆ number, types (parameters) of samples collected

◆ field measurement results (such as pH)

◆ unusual circumstances that may affect the sample results.

Entries in the field book should be made with ink. If you make an error in the field book, cross it out rather than whiting out or erasing. Number the pages of the field book consecutively. To ensure that the bound field book is a complete record, do not rip out pages from it.

It is desirable in addition, though not required by the general permit, to record the following information for each storm event sampled:

◆ number of dry days before the day the sample was collected, or a statement that there was at least one day of no greater than trace precipitation before sampling.

◆ inches of rain during a 24-hour period

◆ time of sampling as well as date

◆ date and time the rainfall began

◆ date and time the discharge began at the sampling site

◆ duration of the storm in hours

◆ inches of rainfall during the storm

The information you record for the first two items above (number of preceding days of no greater than trace precipitation and inches of rain during a 24-hour period) will serve to document that you met those recommended criteria for sampling specified in the general permit.

Determining if the Sampled Storm Event Met the Recommended Criteria

Section S4.A. recommends that the storm event be preceded by at least 24-hours of no greater than trace precipitation. During times of clear weather, it may be obvious that this criterion has been met. When it is cloudy, you can verify that there has been no precipitation (including overnight) by installing a simple, inexpensive rain gauge at your site.

The same section of the permit also recommends that the storm have a rainfall intensity of at least 0.1 inches of rain in a 24-hour period. This does not mean that the rainfall must last for a full 24 hours, only that from the time it begins raining to the time you stop sampling, the rainfall be of the recommended intensity or greater. To determine this, you should observe and record the time it began raining as well as the time you stopped sampling. What the storm does after you stop sampling is of no concern. In addition to the times rainfall began and sampling ended, your rain gauge will give you all of the information you need to easily calculate the rainfall intensity.

An example rainfall intensity calculation:

Rainfall begins at 9:35 AM (you empty the rain gauge beforehand)

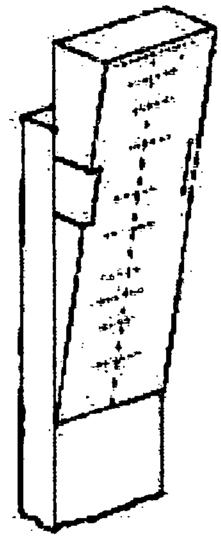
Stormwater discharge at your sampling site begins at 10:05

You complete sampling at 10:30

Your rain gauge shows 0.01 inches of rain when you stop sampling

Rain intensity
= 0.01 inches / 55 minutes
= 0.00018 inches/minute
= 0.00018 inches/minute
x 60 min/hr
x 24 hrs/24 hrs
= 0.26 inches/ 24 hours

The criterion for rain intensity is 0.1 inches / 24 hours. 0.26 is greater than 0.1, so the storm event you sampled meets the recommended criterion.



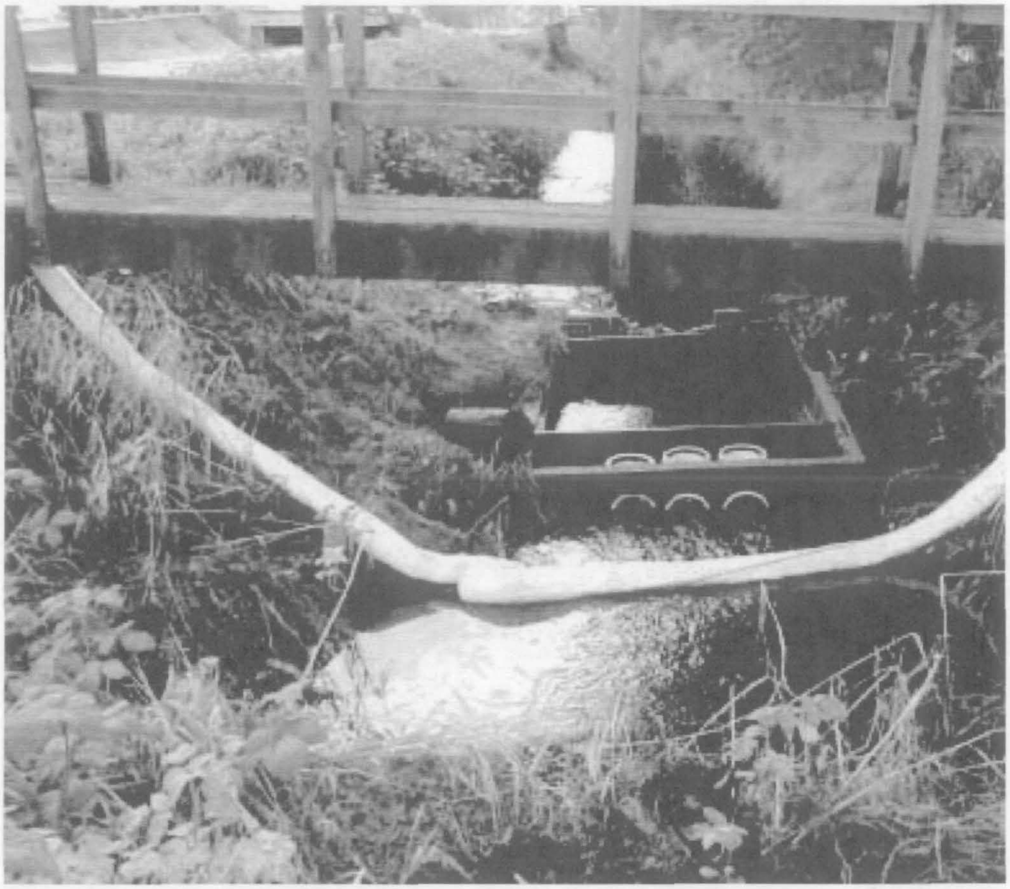
A simple, inexpensive rain gauge mounted on a post. A rain gauge such as this one provides accurate readings at the low rainfalls often associated with the period from the beginning of rainfall to the end of sampling. The gauge can be removed and the water that has collected in it dumped out between rains.

Get the best sample you can.

If you do not have a rain gauge, you will have to rely on rainfall data from other sources. The National Oceanographic and Atmospheric Administration (NOAA) posts daily rainfall records on their website: *http://www.wrcc.dri.edu/state_climate.html.* (Note that there is an underline between "state" and "climate," but no space, in this web address). The data posted is only for the previous day, so you will have to make sure you don't miss the internet posting. A disadvantage of relying on this data is that it is a measure of nearby rainfall but not that from your site. A further disadvantage is that it gives you only daily (24-hour) rainfall data and, while this may indicate a rainfall of less than 0.1 inches in some cases, you may have had sufficient rainfall intensity at your site to meet the recommended criterion of the general permit, had you measured it with a rain gauge.

When the Sampled Storm Doesn't Meet the Recommended Criteria

There may be times when you start to sample but the rainfall intensity turns out not to meet the recommended criterion of the general permit. Or despite your best efforts, you are unable to collect grab samples during the first hour of a storm event that meets the recommended criterion for preceding dry conditions. When this happens, the general permit states that the permittee must still collect and submit stormwater sampling result, and must include an explanation with the monitoring report identifying what recommended criteria were not met and why.



Special Sampling Considerations

Safety should be the primary consideration in sampling. Samples should never be collected in a way that compromises the safety of the sampler. In cases where a physical hazard such as a trip hazard or when sampling near deep water bodies, samplers should work in pairs. Do not wade in water where the estimated depth in feet times the velocity in feet per second is equal to or greater than 8, as swift currents can lead to drowning accidents. Be aware of the slip hazard common near the banks of water bodies and decide whether a bank is too steep to negotiate safely. Safety comes down to individual judgment. Never put yourself in a position you consider to be unsafe.

Collecting grab samples of stormwater is basically a simple process but an important one since getting good results depends on proper sampling. Samples can be collected easily in some locations, but not all stormwater discharges are as readily sampled as the flow in a ditch or from a pipe falling into a receiving water. Below are some situations you may encounter and suggested approaches for handling them. Because oil and grease samples must be collected directly into the bottle supplied by the lab we will consider only methods for collecting samples directly by hand or with a bottle attached to a pole. When sampling in these or other situations, keep in mind the steps outlined in the section, *How to Fill Sample Bottles.*

Sampling as Stormwater Discharges from a Pipe into a Receiving Water

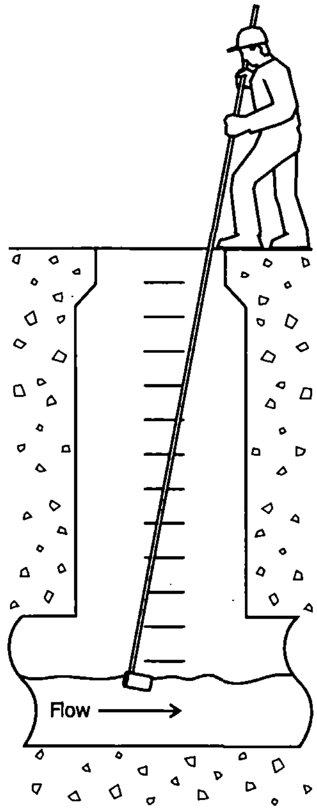
If stormwater is being discharged from your facility through a pipe into a ditch, creek, or other receiving water, it can be readily sampled as it falls from the pipe before it reaches the receiving water if the discharge pipe is safely accessible and not submerged. Hold the bottles with the bottle opening facing upstream (into the flow and be sure not to overfill them. You may need to fasten the collection bottles to a pole to reach the pipe. Attaching a bottle to a pole is described in the section below, *Sampling from a Manhole.*

Sampling from a Manhole

When sampling from the manhole of a municipal storm sewer, remember to contact the municipality beforehand. Discuss sampling being sure to cover safety concerns. Open a manhole with a hook or pick axe, exercising care not to drop the manhole cover on hands or feet. **You should not, under any circumstances, enter the manhole unless trained to safely enter confined spaces,** but you can sample the flow in a manhole from above ground by taping the sampling bottles, one at a time, to a pole and lowering the pole into the manhole.

Each bottle can be fastened to the pole by holding the bottle against it and wrapping tape tightly around the bottom and the top of the bottle as you hold the bottle firmly to the pole. Filament strapping tape works well for this purpose as it is waterproof and strong. If the flow in the storm sewer is shallow, the bottle may have to be positioned horizontally with the bottle's opening somewhat higher than its bottom. When sampling in a manhole, be

Don't take risks - know how to sample safely.



When sampling from a manhole, use a pole to safely sample from above ground. Avoid touching the sides of the manhole or pipes with the bottle to prevent contamination. Place the opening of the bottle upstream so that the flow enters the bottle directly.

careful not to scrape the bottle against the sides of the pipe to avoid picking up extras solids in your sample.

Collecting into bottles with oil and grease samples with a pole is done by plunging the bottle on the pole below the water surface and back upwards. This must be done as a single motion and only once. Because you only get one try at getting a good oil and grease grab sample, it may take some practice and extra bottles to collect the amount of sample you need without overfilling the bottle. Collecting samples other than oil and grease into bottles with preservative can be done by quickly plunging the pole into the flow repeating if necessary until the bottle is most but not all of the way full. If you overfill the bottle, remove it, tape a clean bottle to the pole, and try again. Be sure, when collecting samples with a pole, to follow clean principles by keeping the pole downstream of the bottle while sampling.

Sampling from a Drainage Ditch or Swale

If a drainage ditch carries stormwater flow from your facility offsite, and if it carries no flow other than the flow from your facility, you can sample the water in the ditch simply by placing the bottle where the flow is free, with the bottle opening facing upstream. If you cannot reach a freely flowing portion of the ditch by hand, you may need to attach the bottles, one at a time, to a pole for sampling. Follow the procedure outlined in the section, *How to Fill Sample Bottles*.

If the flow is carried in a small ditch or swale, you can install a barrier device in the channel or deepen a small area so you can gain enough depth of flow to sample directly into the bottles. Make sure to allow for sufficient time after disturbing the bottom so that the solids resulting from muddying the water will not become part of your sample.

Sampling Sheet Flow

It is not always possible to sample stormwater runoff in locations such as ditches or pipes where the flow is concentrated. Sometimes the permittee has no choice but to select sample locations for which sheet flow is sampled before it becomes concentrated. Approaches to sampling sheet flow are described below and illustrated in the figures that follow.

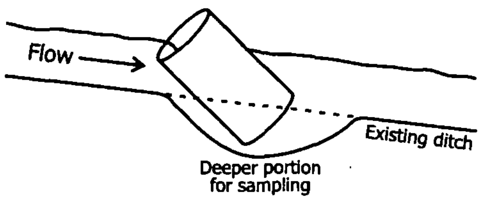
In some cases, a stormwater discharge from a facility is not concentrated at any point and leaves the property in the form of sheet flow as it runs off a work area or driveway or grassy area. In this case the flow may be too shallow for the collection bottle to be filled with sample. It is often possible to find a way to collect the stormwater runoff in these situations.

One way to concentrate sheet flow is to excavate a small basin in an existing ditch or other location where stormwater runoff flows. Another approach is to install a barrier device or trough, gutter, or ditch to intercept and concentrate stormwater flow. As with other sample sites, the flow should be moving and somewhat turbulent so the samples will be well-mixed. Be sure that any excavation you do does not expose the stormwater to be sampled to newly worked soil surfaces that the runoff may erode, increasing the solids in your samples. You may want to consider lining the trough, gutter, or ditch with plastic. Be sure not to introduce materials (such as metals that include zinc) that may contaminate the samples. Sheet flow on paved areas can be concentrated and collected by constructing small bumps, similar to speed bumps.

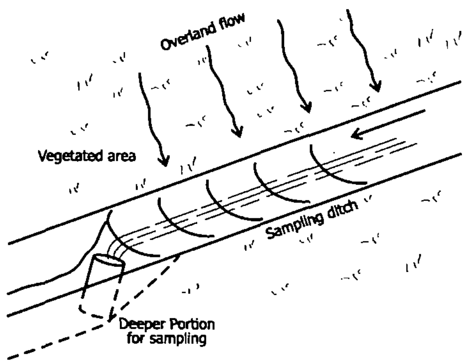
Another way to collect samples from sheet flow is to use a special peristaltic hand pump to pump samples from shallow surface flows. This method is of limited use for collecting the samples required by the general permit as it cannot be used to collect oil and grease samples.

Roger Bannerman of the Wisconsin Department of Natural Resources has developed simple devices to grab samples of sheet flow from paved areas, rooftops, and lawns. Though the devices are intended to be used for simple, automatic sampling, pouring a container of collected sample into other sample bottles, the ways in which they intercept and concentrate flows can be adopted for direct grab sampling.

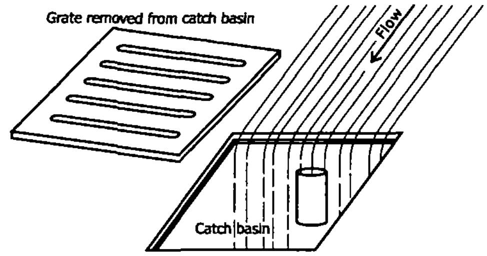
The following figures illustrate the methods of sampling sheet flow discussed above:



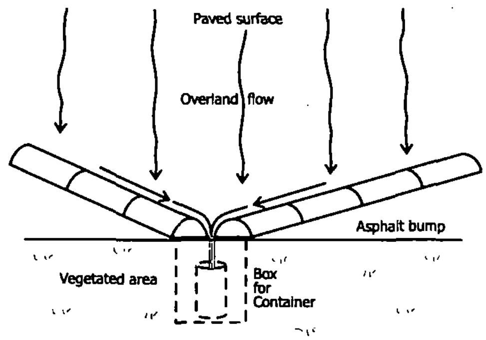
Deepening an existing ditch can allow samples to be collected directly into bottles in some cases. Be careful not to stir up solids from the sides or bottom of the ditch.



Runoff entering a catch basin can sometimes be collected directly into bottles by removing the grate and allowing the runoff to fall into the bottles.



Overland flow from vegetated areas can be sampled by constructing a shallow ditch to intercept the runoff and a deepened area to place bottles to catch the runoff.



Overland flow on paved areas can be sampled by constructing asphalt or concrete bumps to collect and concentrate the flow. A box positioned below ground surface in the paved area or the edge of an unpaved area can provide a place to collect samples directly into bottles.

Sampling from a Stormwater Detention Pond or other BMP

When stormwater from a facility discharges after flowing through a detention pond or other treatment system, sample as the stormwater flows out at the discharge point. Ponds may hold stormwater for a time before discharge begins. Sample within the first hour, preferably 30 minutes from when the pond begins to discharge.

Ecology Wants to Hear from You

If you have suggestions on how Ecology can improve this guidance document, have developed innovative sampling techniques, or just want to comment on stormwater sampling, please contact

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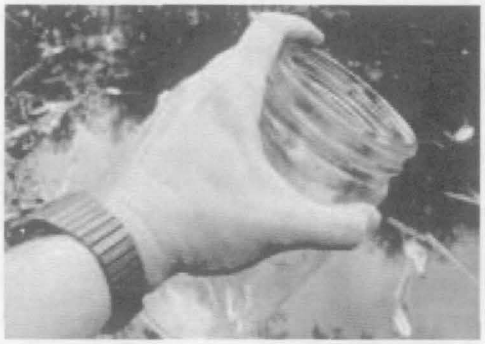
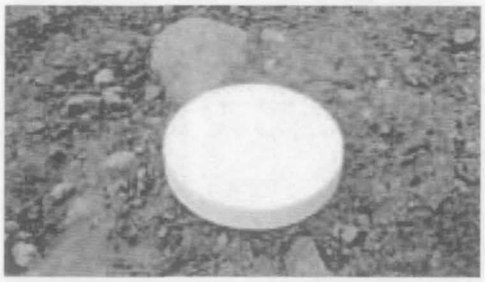
Appendix - Proper and Improper Methods of Sampling



Do not *touch openings of bottles. Keep bottles clean to prevent contamination.*

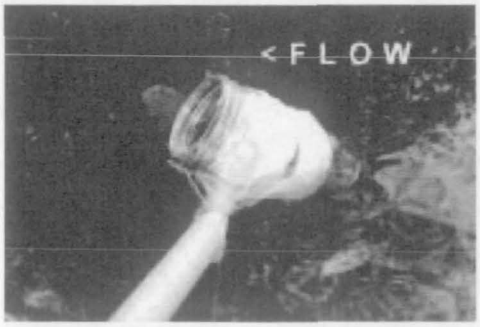


Do not *allow bottle lids to touch ground. Keep lids clean to prevent contamination.*

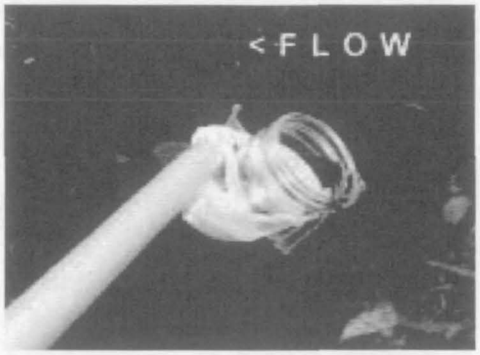
Do not *sample in stagnant areas with little flow.* **Do not** *stir up bottom sediments or allow foreign materials to enter the sample bottle. (***Do** *be careful to grab a clean sample in cases where stormwater runoff is shallow.) If the runoff is so shallow that it is not possible to sample without the sample being contaminated in the process, then find an alternative way to sample.*

Do *attach a bottle to a pole for sampling in manholes or when a hand sample would be in stagnant water. A boathook is used in this example and the bottle is attached to it with filament strapping tape.*

If the water is too shallow to sample with the bottle upright on the pole, try taping it on sideways, but tilted up slightly.



Do not *sample with the bottle opening facing downstream, when using a pole or sampling by hand. Water flowing past your container, pole, or hand and into the container can be contaminated by such contact.*



Do *sample with the opening of the bottle facing upstream, into the flow so the water will enter directly into the bottle. This is true when sampling either by hand or with a pole.* **Do** *sample water that is rapidly flowing rather than stagnant.*

Do not *allow water to overfill the bottle, particularly not for sample bottles with preservative. Oil and grease samples should be collected from water falling into the bottle when possible, or otherwise in a single swoop.*

Do *collect samples without overfilling the bottles.*

References

Bannerman, R.T.; Owens, D.W.; Dodds, R.B.; Hornewer, N.J., 1993. *Sources of Pollutants in Wisconsin Stormwater*, Wat. Sci. Tech. Vol. 28. No. 3-5, pp 241-259.

Colorado Department of Public Health and Environment; Water Quality Control Division; Colorado Discharge Permit System, 1996. CDPS Stormwater Sampling Guidance Document.

Dodson, Roy D., 1995. *Storm Water Pollution Control: Municipal, Industrial, and Construction NPDES Compliance*, 1999, 1995. Second Edition. McGraw-Hill.

Ecology, 2005. *The Industrial Stormwater General Permit: A National Pollutant Discharge Elimination System and State Waste Discharge General Permit for Stormwater Discharges Associated with Industrial Activities.* State of Washington Department of Ecology, January 14, 2005.

Ecology, 2000, 1999. *Field Operations and Safety Manual: Environmental Assessment Program*, Washington State Department of Ecology, Environmental Assessment Program, Updated August 2000.

New Jersey Department of Environmental Protection Division of Water Quality, 1998. *General Sampling and Reporting Guidance for PAS and ADI Form.*

Thrush, Cindy and De Leon, Dana B., 1993. *Automatic Stormwater Sampling Made Easy*, Water Environment Federation.

United States Environmental Protection Agency, 1992. NPDES Storm Water Sampling Guidance. EPA 833-B-92-001.

Waschbusch, R.J.; Selbig, W.R.; Bannerman, R.T., 2000. *Sources of Phosphorus in Stormwater and Street Dirt from Two Urban Residential Basins in Madison, Wisconsin, 1994-95.* National Conference on Tools for Urban Water Resource Management and Protection Proceedings, February 7-10, 2000, Chicago, IL.

Wisconsin Department of Natural Resources Bureau of Water Management Municipal Wastewater Section – Storm Water Unit, 1994. *Wisconsin's Guidance for Industrial Storm Water Monitoring.*

Torno, Harry C., 1995. *Stormwater NPDES Related Monitoring Needs*, American Society of Civil Engineers.

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